SCIENTIFIC AMERICAN

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THE ARTHUR KILL BRIDGE.

We illustrate in the present issue the great drawbridge spanning the Arthur Kill and connecting the States of New Jersey and New York. The inlet or strait which it crosses runs between Staten Island, which constitutes Richmond County, N. Y., and the opposite shores of New Jersey. The stream is about 600 feet in available width at the point where the bridge is erected. Were the shores of New York harbor to be inspected with a view to finding the best frontage for public stores and wharves, no better locality could be selected, as regards the water front, than the shores of Staten Island. But hitherto this region has not been available for these purposes for lack of railroad communication. The new bridge, which is designed to afford a way for the great trunk railroads to reach the shore in question, will, therefore, play a most important part in the development of the port of New York. Five to ten miles of additional water front, it is calculated, will be opened up by it. The Baltimore and Ohio, the New Jersey Central, the New York, West Shore, and Buffalo, with other roads, are among the probable users of the bridge.

The structure was erected by the Staten Island Rapid Transit Company. It was authorized by act of Congress of June 16, 1886, and two years were allotted for its completion. On June 13, 1888, a party of engineers and promoters of the scheme visited the place, and the great draw was swung around from open to closed position, and the kill was crossed by a bridge for the first time only three days before the limit assigned by the charter.

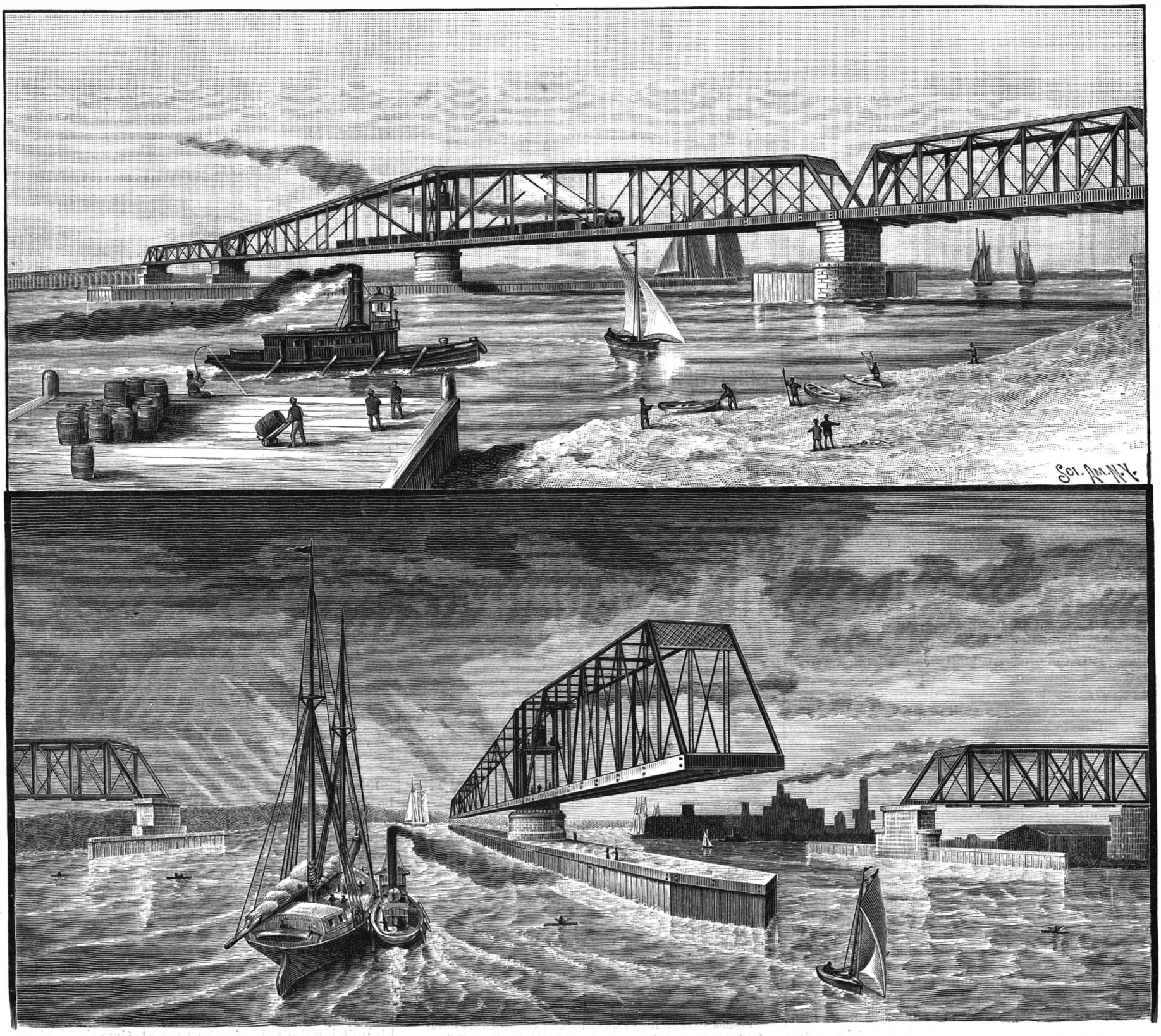
The bridge, being owned by an independent corporation, will be open to traffic under similar conditions to those offered by the Poughkeepsie bridge. Any railroad wishing to use it can do so on payment of the regular tolls. This arrangement removes from it any aspect of monopoly, and tends to make it a public benefit in every sense.

Some very interesting litigation was evolved by the erection. The bridge, it will be noticed, is an interstate bridge, and was erected under Federal authorization. The plans and location were subject to the approval of the Secretary of War of the United States. He held them under consideration for nine months, and eventually approved them without modification. The work was at once commenced, only to be delayed an additional six months by an injunction. This was procured by the State of New Jersey, represented by Gov. Green, the proceedings being in charge of Attorney-General Stockton. On argument this impediment was disposed of in the United States Circuit Court by Justice Bradley. He decided against the injunction, holding that Congress had the constitutional right to regulate commerce, even though the States directly concerned might be opposed to its action. The decision has attracted much attention, and may yet be of much importance.

The two years allowed for the completion of the work were very seriously abridged by these causes, and the completion of the structure within the specified time, without any extension being asked for, is a matter for congratulation to all directly concerned in the work.

The trusses and drawbridge are carried upon five piers of masonry. These are built of the best material, Lake Champlain granite of the first quality being adopted. Much trouble was experienced in laying them, as a solid foundation was only reached with great difficulty.

The entire length of the bridge proper, exclusive of approaches, is eight hundred feet. It comprises two shore spans, covered by fixed trusses, and two draw



NEW BRIDGE OVER KILL VON KULL—THE LARGEST DRAW IN THE WORLD.

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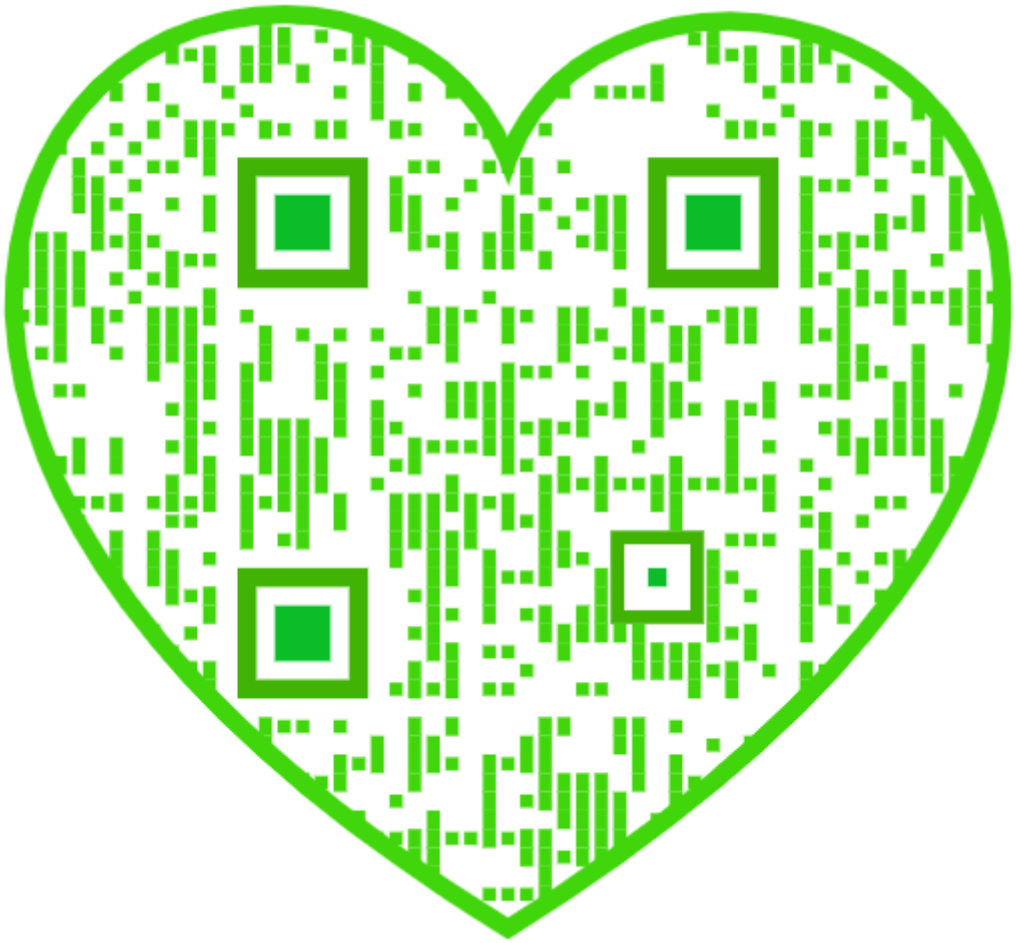

spans, closed by the great drawbridge. Each shore span is one hundred and fifty feet long. The drawbridge is the largest now in existence. Its total length is five hundred feet. On each side of its central pier it affords, when open, clear waterways of two hundred and eight feet width. It will require about two minutes to open or close it. The lower chords of the trusses are thirty feet above the water line. The cost of the structure was $450,000.

In the eight hundred feet of bridge thus composed, the link is far from complete. On the New Jersey shore numerous lines of railroad and fillings for the various companies who are to use the bridge have to be included in the system. On the Staten Island shore a most extensive work is in progress, designed to afford an approach to the bridge. This will commence about one-half mile from Erastina, and will be five thousand seven hundred feet long. This alone will cost $70,000.

The iron work was pushed with great rapidity, and under considerable apprehensions at times of delay from strikes. Fortunately these apprehensions proved needless. In four weeks the draw span was put together. Two weeks more were required for the installation of the machinery. The draw contains six hundred and fifty-six tons, and each of the approaches contains eighty-five tons of metal.

The whole will be finished as regards approaches, track, etc., it is hoped, by the end of August, and early in September trains will probably be running across the bridge.

The contractors for the masonry are Messrs. Boller & McGaw, of this city, who have erected much important work, and who are now engaged in the building of the bridge over the Thames at New London, Conn. The superintending engineer is Mr. Charles Ackenheil. The Keystone Bridge Company has supplied the iron work.

It is gratifying to note that not a single life was lost in the erection. In too many cases the march of progress is marred by deaths from accidents incidental to such works as the present, but the Arthur Kill bridge is completed without any such stain.

Rheumatism.

The surroundings of a patient suffering from rheumatism are a matter of no little importance. The Boston *Journal of Health* says: Free ventilation should be secured, but without draughts, and the temperature kept between 68° and 70° Fah. The patient should be clothed in flannel and lie between woolen blankets. His covering should be light. An excess of bedclothing will add to the pain in the inflamed joints, and unnecessarily increase the sweating. It should be a studied effort to spare him any painful movements possible, and every ministration should be gentleness itself. Milk, with seltzer water or lime water, pre-eminently meets the requirements as the principal article of diet, during the active period of the disease. If this proves insufficient, or is not well borne, then other light and concentrated food can be administered. Some authorities insist that animal food and alcohol are contra-indicated during the height of the fever. The latter should certainly be prohibited, as a rule, but the patient's diet need not be so much restricted as in other highly febrile disorders. Those who are habituated to the use of stimulants should not be entirely deprived of them.

Hektograph Sheets.

Soak 4 parts of best white glue in a mixture of 5 parts of water and 3 parts of solution of ammonia, until the glue is soft. Warm the mixture until the glue is dissolved, and add 3 parts of granulated sugar and 8 parts of glycerin, stirring well, and letting come to the boiling point. While hot, paint it upon white blotting paper with a broad copying brush, until the paper is thoroughly soaked, and a thin coating remains on the surface. Allow it to dry for two or three days, and it is then ready for use. An aniline ink should be used for writing, and before transferring to the blotting paper, wet the latter with a damped sponge, and allow it to stand one or two minutes. Then proceed to make copies in the ordinary way. If the sheets are laid aside for two days, the old writing sinks in and does not require to be washed off.—*Chem. and Drug.*

Destruction Wrought by Insects in America.

The annual loss to productive industries in the United States caused by insects is estimated at $150,000,000. Here is a fair battle between man and another sort of earth occupiers. They are smaller, but if they can whip us, have undoubtedly as good a right to the world as we have. As civilization advances, new insects make their appearance, marching sometimes eastward, but generally westward. There are few, if any, forms of vegetation that have no parasites that devour either foliage or fruit. The loss to the cotton crop is estimated at $15,000,000 a year, while that to the apple crop is not much less, and that to the potato crop at least one-half as much. But the estimate is not a fair one until into the loss is counted the time spent in fighting to secure the proportion that is saved.

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NAVAL NOTES.

A great fleet, made up of vessels of many nationalities, was recently assembled in the port of Barcelona, Spain, in honor of the birthday of the Queen Regent.

Here is a list of them taken from *L'Avenir Militaire:*

Austria-Hungary.—Admiral the Baron de Montfort commanding.

Custoza, armored.....	7,000 tons.	14 guns.	630 men.
Tegethof, "	7,450 "	12 "	510 "
Prince Eugene, armored.....	3,640 "	12 "	450 "
Don Juan d'Autriche, armored	3,640 "	12 "	450 "
Empereur Maximilien, "	3,600 "	12 "	446 "
Leopard, torpedo cruiser.....	135 "		
Panther, " "	135 "		
Meteor, torpedo destroyer	350 "		

Germany.—Kaiser, armored, 7,626 tons, 15 guns, 630 men.

England.—Admiral the Duke of Edinburgh commanding. Armored ships Alexandra, Colossus, Agamemnon, Thunderer, the cruiser Phaeton and dispatch boat Fearless, corvettes Calypso, Rover, Volage, and Active.

United States.—Corvette Quinnebaug, 1,900 tons, 10 guns, 230 men.

Spain.—Numancia, 7,500 tons, armored, 15 guns, 560 men, and the cruisers Castilla, Navarre, Gerona, Reina-Regente, each carrying from 8 to 29 guns and from 300 to 540 men; the frigate Blanca, 16 guns, 350 men.

France.—Admiral Amet commanding. The armored ships Colbert, Devastation, Amiral Duperré, Indomptable, Courbet, Redoutable, the dispatch boats Faucon, Condor, Milan, and Couleuvrine, and five torpedo boats.

Holland.—The cruiser Jean Guillaume, 3,000 tons, 14 guns, 313 men.

Italy.

Italia, armored.....	13,700 tons.	22 guns.	750 men.
Lepanto, "	13,700 "	22 "	750 "
Dandolo, "	10,510 "	8 "	429 "
Duilio "	11,608 "	8 "	439 "
Castelfidardo, armored.....	4,260 "	8 "	450 "

The cruisers Bausen and Vesuvio, and six torpedo boats.

Portugal.—Vasco de Gama, 2,479 tons, 7 guns, 192 men.

Russia.—The cruisers Westrick and Zabiaka.

This gathering of ships of all the modern types but one afforded an excellent opportunity for comparison, and the naval student was not slow to take advantage of it, the foreign journals printing many columns of their observations and criticisms. The one type missing was that of which the Japanese cruiser Nan-iwa-kan is the exponent—a type, be it said, which eminent naval authorities have declared to be the most effective and reliable of any yet devised—swift, easily handled, and strong of battery, compared with the weight. Curiously enough, it was such small powers as Japan, Brazil, and Chili that were the first to truly estimate the value of this type, while the great powers, notably England and Italy, were yet building their slow-going leviathans.

Many of the big ships did not dare come in to their anchorages till the ebb tide served, fearful of running foul of their neighbors or the shore while turning to head the tide and drop their anchors, standing on and off outside till the sub-current of the ebb began to run out strong—for they are of deep draught—then coming in slowly, waiting to gather sternway and letting go their great bowers.

In swinging, too, when the tide changed, many are said to have shown the unwieldiness of their designs, in some cases overrunning their anchors before the chains could be overhauled and the anchors reset for the new tide; and such continual working of steam windlasses and such a rattling of chains coming up through the hawse pipes and going out again, the Spaniards never heard before.

Our own Quinnebaug, being of ancient design, did not cut much of a figure when it came to steaming, though flying the handsomest ensign of all, for she is only good for 11 knots an hour with a gale behind her and a fair current running its best; but if the slovenliness of the big ships was not exaggerated, the Quinnebaug could certainly beat them all in handiness and certainty of movement.

Like all our ships, the Quinnebaug has what might be called a congress of nations aboard—Germans, Swedes, Danes, Norwegians, Austrians, Italians, English, Irish, Scotch, Russians, and Negroes; and when a portion of one of the watches was given an hour or so ashore, if they had any such liberty, they must have attracted some attention, speaking all languages as the men do, and the natives, no doubt, got some curious notions of Yankee men-o'war's men.

Since the war the Yankee sailor has gradually disappeared, there being no more excitement and prize money in the life; though there is good reason for the belief that the fact he could, because of his intelligence, earn more money ashore had much to do with his quitting the sea. At the present time the Yankee man-o'war's man is almost as extinct as the dodo.

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MASTER CAR BUILDERS IN CONVENTION.

The convention of 1888 met at Thousand Islands on the 20th of June. The proceedings were not of great importance. A report was presented on the best form and construction of car roofs. After this, a report was made by the committee on car heating, from which it appears that the States of New York, Massachusetts, and Michigan have passed stringent laws prohibiting the use of stoves in cars. The committee in their report state that during the past year several of the railway companies have made extensive experiments in car heating by steam taken from the locomotive. The committee is of opinion that the steam pressure should be kept as low as possible, because the rupture of a highly charged steam pipe in a car filled with passengers would prove as disastrous as the so-called "deadly car stove," and the effect of high pressure steam escaping from the traps and from the rear of the train has been found objectionable on account of injury to the paint and varnish of the cars, as well as from condensation at the stations.

As to the best means for retaining heat in the car after the locomotive or source of heat has been disconnected, the committee regards it as an open question. The retention of the stoves within the cars, the use of hot water circulation, or a drum filled with brine within the steam pipe, seem to have been the most general ways of accomplishing this end. The committee were unable to make any definite recommendation on the subject.

In respect to steam couplers, the committee was instructed to recommend two couplers for ballot, so that one can be chosen as the standard. A form for a standard axle for a 60,000 pound car was adopted, to be submitted for approval by letter ballot.

The report of the executive committee on automatic freight car couplers was presented, in which it appears that the letter ballot resulted in the adoption by 474 against 109 of the Janney style of coupler, as the type of the Master Car Builders' Association. A 30 inch drawbar was also adopted.

Mr. William McWood was re-elected president. The convention adjourned to meet at Lake George in 1889. A large number of interesting exhibitions of railway appliances was presented to the Association.

Electric Transmission of Power.

Electric railways are becoming so common that the announcement of a new line or the adoption of electric locomotives scarcely attracts attention. The Union Electric Company's nine locomotives are doing excellent work in the Pennsylvania coal mines, and present some evident advantages over the steam locomotive underground. The electric transmission of power in the mining districts has already developed an enormous market for electrical machinery. From every part of this country and from nearly every foreign country inquiries are coming to our manufacturers of electric plant, showing the interest which is being taken in this great advance in engineering throughout the world. South Africa and Japan, Australia and Mexico, as well as all parts of this country, are wanting electric motors and electric transmission of power, and are all seeking for the machines here; for though this branch of engineering is still in its very infancy, American practice appears already to have taken a distinct lead.

We recently described an 18 mile installation for pumping, hoisting, etc., on the Big Bend of the Feather River, Cal., which is under contract by the Sprague Electric Motor Company.

In Arizona an installation is proposed to bring about 150 horse power from a water fall to a large mine and smelting works, a distance of 8 miles, and it is estimated that the conductors will call for 8 tons of copper to the mile. This is an indication of one of the potent allies of the copper syndicate which may help to absorb their large surplus of copper. On the Comstock it is proposed to use electric transmission to run, in part at least, the new Nevada mill. At present this mill, which has 20 stamps, is run by a Pelton impact water wheel, 11 feet diameter, using water under a head of about 650 feet, derived from the ditch of the Virginia & Gold Hill Water Company. It is now proposed to take the water after it has driven this wheel, lead it down the Chollar shaft to the level of the Sutro tunnel, where it will have about 1,600 feet head, and there drive another 11 foot diameter Pelton wheel.

The underground installation will consist of five dynamos, and the power will be transmitted to the mill at the surface, about 2,000 feet, through a five-eighths inch copper cable, and electric motors will then utilize it to drive the mill, which, as enlarged, will have 60 stamps, 30 pans, etc.

The consumption of water will be regulated to the power required to drive the mill, and it will undoubtedly be very much less with the 60 stamps than it now is with 40. As the water has to be bought, this will probably prove a substantial economy.

In the Consolidated Virginia and California mills the power has been transmitted through wire ropes from water wheels situated at intervals of 500 feet vertically in the shaft, utilizing the pressure down to the level of the Sutro Tunnel; but faulty construction occasioned much trouble, which it is hoped can be altogether overcome by the use of electric transmission, which is to be used should the Nevada mill experiment result satisfactorily, as it no doubt will.

A Silver City, Idaho, mine is putting in a Sprague electric plant, to drive a 50 stamp mill four miles away from a waterfall, while the same manufacturers have recently received an order for an electric plant to be used in training and elevating the guns on the new United States cruiser Chicago.

We also hear of an iron company in the South thinking of running dynamos at the furnace to drive pumps several miles away.

From all parts of the country come inquiries concerning the economy of this method of transmission of power, and certainly in many cases the conditions are extremely favorable to the electric plant.

It would far exceed the limits of space at our command to enumerate all the projected electrical plants which have been reported. Nearly every town either has, or proposes having, electric tram cars. Many of our mines and metallurgical works are proposing to use electric locomotives, either with conductors or storage batteries. Nearly all mills and furnace works use electric lights. Mining machinery, drills, coal cutters, pumps, and hoisting engines will be driven in many places by what is now the waste power of neighboring waterfalls, and before long we shall have few waste waterfalls. No is it true of this country alone. Foreign countries, especially those that are ill provided with cheap fuel, will through the aid of American electrical machinery share the benefits which we expect to reap in at home.—*Eng. and Min. Journal.*

Exhibition of Appliances for the Prevention of Accidents.

A novel exhibition, open to competition from all parts of the world, is to be held in Berlin next year, during the months of April, May, and June. It is proposed to exhibit all forms of appliances designed for the saving of human beings from accidental injuries. This definition is broadly interpreted, and a very well arranged classification has been adopted. The idea of the exposition had its origin in a discussion held by the Institute for Brewing, at Berlin, in 1887. It appeared that workmen were in such constant danger from moving machinery and other factors of danger in industrial establishments, that a good work might be done in inaugurating a spirit of competition among the world of inventors in the matter of saving factory operatives from accidents.

The Prussian government has, in a practical manner, approved of the plan by giving the use of the large exhibition place in Berlin, near the zoological garden, to the committee free of charge. Exhibits of all classes of articles bearing in any way on the protection or saving of life in factories will find a place in the exhibition. This is insured by the well planned classification we have already alluded to. It is too long for us to give here, but it is well worth inspection as a sample of thorough organization.

To enlarge the scope of the exhibition and to make it more useful, it is judged of importance to have manufacturers send the apparatus, or models of the same, which they may have devised for their own private use. This will prevent the affair from taking the form of a mere contest between rival dealers in life-saving machinery.

A special consular report has been issued by the United States government *apropos* of this interesting occasion. It is to be hoped that America will be worthily represented there. Unfortunately, the date of entering exhibits is set at so early a period that it seems doubtful if this country can contribute a fair representation. An illustrated report of the exhibition is in contemplation, and if issued will be a most interesting document.

Patent Rights and the Dental Profession.

The question, "Is dentistry a profession?" is no longer argued even by intelligent people outside of the profession. It is admitted everywhere. Frequently, however, we see very quaint and curious ideas of what dentists as professional men should do and what they should not do in order to maintain their professional standing. The most unique idea of all is that appliances invented by the ingenuity of the dentist must not be patented, and if he does secure such patents, he must at once be dropped from the professional ranks. Now, the fact is, the action of patenting any appliance or method has nothing at all to do with the professional standing of any dentist; it is not *per se* an unprofessional act. If any man freely and fully grants to his profession, without restriction, the use of any method he has discovered, let all praise be his; but because his neighbor cannot afford to do this, or does not do it, let no man be so weak and unjust as to say that he has acted unprofessionally. Indeed, he may be, and no doubt often is, in every-day life and practice the better professional man of the two.

A man's professional standing, we are happy to know, is determined by his intelligent, competent procedure in professional ways and by the noble and gentlemanly character which gives direction to every phase of his life's work, and very little by the fact that he has or has not taken out a patent upon any of his inventions.

In the name of all that is logical, we wish candidly to ask all reasonable persons if a dentist has not as good a right to receive payment for an invention over which he has spent time, thought, and money as he has to receive payment for any of the usual operations in dental practice. His invention represents time, outlay, and brain power, just as much as does the gold filling which he inserts, and why should he not receive the compensation which a patent secures?

Our authors, our literary men, secure copyrights upon their books and manuscripts, and yet no one is so dull and illogical as to accuse them of unprofessional conduct. Certainly not; they deserve protection. Now the patent right to the inventor is just the same as the copyright to the author, and they both have a perfect and legitimate right to secure the benefits coming with such protection without being called to account for being "unprofessional" by writers who cannot be said to have grasped the true meaning of the term.

Patent rights, as well as copyrights, are productive of much injustice and subject to many abuses, but no reasonable man will argue from this fact that there is anything belittling or unprofessional in securing a patent right or a copyright. We honor the man who gives his inventions to his profession without price as highly as do any of our cotemporaries, but we strongly deny that a dentist who secures a patent can—on that account—be called unprofessional.—*Western Dental Journal.*

Testing Waste and Soil Pipes and Preventing Sewer Gas Entering Unoccupied Houses.

The *Sanitary News* considers the water test among the most severe ones. Air pressure, while not so satisfactory in point of immediate results, has the advantage of being distributed with nearly equal force to every point in the system. The mercurial gauge easily detects the fact of a leak, and the substitution of an odorous smoke for air quickly locates the spot. The peppermint test is well known as being well adapted to old work as well as new. A modification of this was tried the other day in this city by a gentleman whose cat was made the detector. An infusion of valerian was poured down the vent pipe, and pussy was given the run of the rooms and passages where any escape might reach. She located three leaks, and came near uncovering them, too, in her eagerness to reach the, to her, attractive odor.

The *Review and Record*, of Brooklyn, advises when a house is vacated for a short time, either the filling the traps with glycerine or having a plumber take charge of the house and see that the pipes are flushed and the traps filled in every ten or twelve days. The Chicago plumber has something to say on this important subject.

Three advised the filling of the traps with glycerine, two more advised turning off the water after filling the traps, a third would fill the *bowl* of the closet with glycerine, another would remove the water closets and bath tubs and solder a lead cap over the trap, while a fifth recommends *salt.*

The diversity of views is not very marked until the *salt* is reached, and then the *Review and Record* says: We confess to a mild sort of surprise that any plumber would recommend such a substance. First, we would have no means of knowing when the trap would be filled sufficiently, and secondly, how are we to do the filling? Shall we have to remove the fixtures, pack the trap well, and then replace the fixtures again? And, having done this, are we to rest satisfied with this "dry packing," and take no precaution against the "porosity" of this filling?

No one acknowledging to have given the subject proper attention could claim for a mass of salt such a degree of imperviousness as would resist the pressing sewer gas, and as we have no desire to place our readers in such a "pickle," we will stick to the glycerine theory or to the regular flushing with traps at short intervals, so as to guard against the loss of seal by evaporation. We have no doubt that the removal of the fixtures and the capping of the traps would be excellent—for the plumber—but as other opportunities for making an honest dollar are not scarce, we must in this instance leave him to his own resources.

A Disgrace to Civilization.

The Chicago *Journal of Commerce* states that three newsboys of that city, guilty of no misdemeanor, were arrested last week at their request and sent to the Bridewell. Their reason for wishing to go there, as stated to the police justice, was that they wanted to learn a trade. Under the laws of the trades unions there is almost no chance for the American boy to learn a trade in any shop or manufactory outside of a house of correction.

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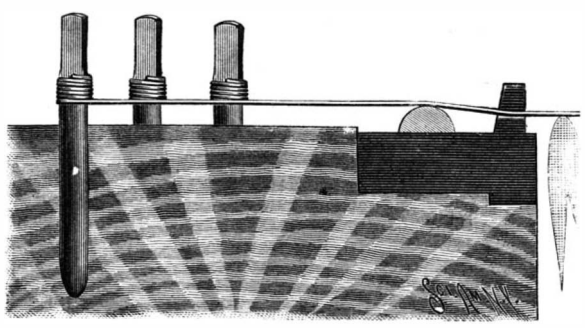
THE MASON & HAMLIN PIANOS AND ORGANS.

The increased knowledge of music and love of harmony that of late years have spread throughout the United States make it more than a matter of sentiment and national pride that America should be worthily represented to the world as a producer as well as a user of musical instruments. We illustrate in the present issue some of the productions of a typical American firm which already, by the manufacture of reed organs, has earned enviable notoriety throughout the world. They have more recently entered a new field, and are producing grand and upright pianos which, in their general good qualities and features of construction, especially as affecting the stringing, seem destined to fill as honorable a role as is now filled by their predecessors, the Mason & Hamlin organs.

Of late years the manufacture of pianos has settled practically into that of two classes, the grand and the upright. The square piano is generally considered out of date and very few are manufactured. The firm of Mason & Hamlin restrict their manufacture of pianos to the grand and upright forms. The distinguishing peculiarity of their instruments is the arrangement of stringing. We show both the new and the wrest pin systems of stringing, and on the most cursory inspection it will appear that the new system adopted by the firm of which we are speaking is the more mechanical. The other or "wrest pin" system, in which the wrest plank performs the duty of holding the pins around which the



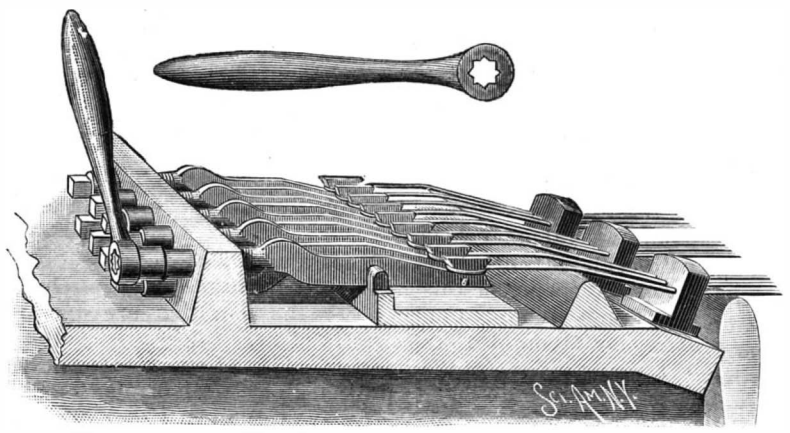
THE "WREST-PIN" MODE OF STRINGING.

wires are wound, is characterized by numerous defects. Although made of the most carefully seasoned wood and built up by the most approved methods, the wrest plank is inevitably subject to atmospheric influence, which causes the wood to expand and contract. The tension of the strings, being entirely dependent upon the friction between the pins and the holes, is very liable to vary. One reason for this is that every time such a piano is tuned, more or less wear comes upon the holes in the wood, and the latter, being a comparatively soft substance, is bound to yield thereto. Besides this, in the hands of an incompetent tuner, the wear upon the wrest plank, tending to enlarge the holes and loosen the pins, may be so great that such a person will seriously damage an instrument.

Under the influence of atmospheric changes, the shrinking and expanding of the wood before alluded to is a cause of still further deterioration in the same direction, as the holes are inevitably enlarged by such cause. In order to tighten or loosen the strings with precision, a number of trials are always necessary, and sometimes the last degree of tension is given by slightly bending the pins toward or away from the sounding board. Of course a very serious element of destruction is here developed. The strings are also very liable to break as they are continually wound and unwound about the wrest pins in tightening and loosening. Repeated bending of a wire will break it eventually. In liability to heat changes the wrest pin system is defective. When a pin breaks, it is quite a serious operation to repair the damage, as the hard cylinder of steel, which is completely buried in the wood, can only be removed with great difficulty.

THE MASON & HAMLIN SCREW-STRINGER.

The Mason & Hamlin system of stringing is so simple, and so obvious from the drawing, that a few words



THE MASON & HAMLIN STRINGER, AS APPLIED TO GRAND PIANOS.

can describe its details. On the surface of the iron main frame a rib is cast, the strings are fastened to lugs with screw ends, these ends go through the rib, and a square-headed nut is screwed on each one. By turning the nut one way or the other the string is tightened or loosened. In this arrangement it will be remarked that all the strain comes directly on the iron plate, and that the tension is due to screw resistance, and not to simple friction. The wires start directly from the lug, passing in almost a straight line to the agraffe and binders, so that the strain upon them is substantially a straight one. The chief reason for the breaking of wires in a piano is the bending back and forth upon the wrest pin. Here this feature is entirely done away with. Moisture, of course, has no effect upon such an arrangement, and heat and cold are also practically without influence. If the strings tend to lengthen by rise of temperature, the same change affects the frame, so as to keep up the tension upon the strings, whose correctness of pitch, therefore, is entirely independent of all climatic and hygrometric changes.

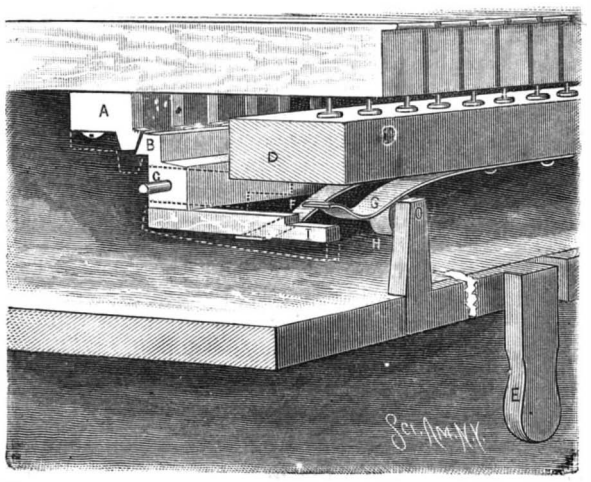
The tuning by the ordinary system is a tentative process, the key has to be turned back and forth until the proper pitch is reached, the last adjustment being often attained by a slight jar given to the tuning key. If the last movement is not in the right direction, the piano will not stay in tune. In the new system, by means of the star wrench, the string is tightened or loosened definitely until the proper pitch is reached, without any attempt at hitting the pitch by chance. In old times, when gut strings were used, requiring low tension, the system of frictional tuning pins was quite sufficient, but it seems obvious that in the modern piano forte, with its wire string at exceedingly high tension, some more efficient way of straining these strings is necessary.

REMARKABLE CAPACITY TO STAND IN TUNE.

In standing in tune, the most remarkable results are attained by these instruments. They require only about one quarter the tuning of an ordinary instrument, and their exemption from deterioration of pitch is extraordinary. When the tuner has once learned their manipulation, he can tune them very much more rapidly than those made on the wrest pin system.

THE PEDAL-POINT STOP.

The organs manufactured by this firm embody in their construction many features of interest. We illustrate the action of the 'pedal-point" stop, which is now used on the Liszt organ. It is operated by the knee, pressing a knee stop one way or the other. Referring to the drawing, this stop is represented by E, and in its movements to right or left carries with it a roller, H. A long block, covering one or two octaves, is pivoted at C, and at B the block is cut so as to form one element of a latch. Each of the keys within the range of the block is provided with a corresponding latch element, of which one is shown at A. The spring, F, pressing the arm, I, upward, keeps the latch in condition for acting. If now a key within the range of the latch is depressed, the long block is rotated and the part, A, of any given key catches under the latch, B. The spring, F, causes this action to take place. Referring to the drawing, the stop, E, under these conditions is pushed to the left. If, however, it is pushed the other way, the spring, G, much stronger than the spring, F, is allowed to press upon the lever, I. This draws back the latch block, so that any key held down is released and rises to its place, and any new key pressed down will not stay there. When the latch block, however, is allowed to act, one or more keys within its range can be depressed simultaneously, and will then be held down. Every new key thus depressed releases all the others.



"PEDAL-POINT" MECHANISM IN MASON & HAMLIN LISZT ORGAN.

The Lisztorgan, to which these improvements have been applied, is remarkable for the purity of its tone. It is a reed organ on the American plan, working by a partial vacuum. It possesses great freedom from reediness in sound. The reed has been improved and given so peculiar a shape as to avoid this difficulty.

The Eolian harp stop resembles the Eolian harp. Its tones are produced by two sets of reeds of two feet pitch, which are tuned a trifle out of unison, so that a slight beat is heard when they are in action.

MASON & HAMLIN GRAND PIANO.

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Destruction of our Elms.

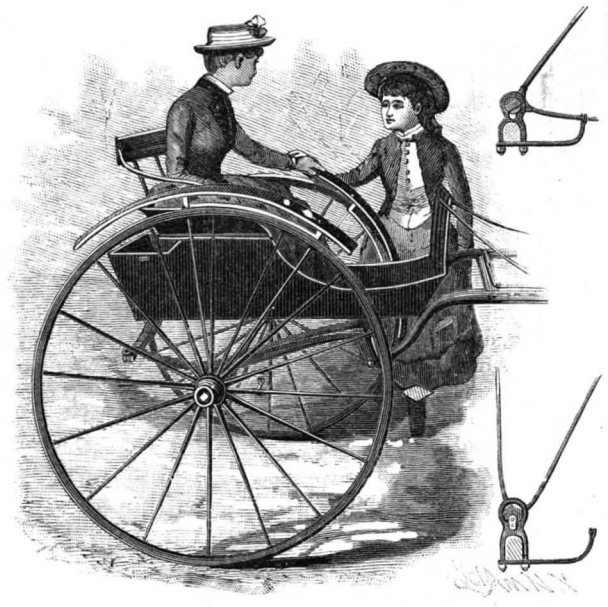
The elm leaf worm has made its appearance again this year, destroying the foliage on the elms in our parks and on the highways in the vicinity of New York. The depredations of the larva of the imported elm leaf beetle have now become so great in the Eastern States that Mr. F. Bronncoke, of Westchester County, who seems to have made a study of the subject, thinks it is quite probable that all the European species of the elm, if not the American, will soon be destroyed. The beetles seem to prefer the European elms, but as soon as these are stripped of their leaves they go directly to the indigenous elms. All the remedies thus far tried or suggested are unsatisfactory, owing to the difficulty of application. On small trees the worms may be destroyed with kerosene emulsion, carbolic acid solutions, creosote, tar water, etc., but on very tall and large trees the cost of applying insecticides would be far more than the trees are worth. Furthermore, it is a waste of time for one man to apply remedies while his neighbor allows the beetles to breed unmolested, for these insects have wings and know how to use them when in search of food.

To Tan and Color Sheepskins with Wool on.

Tan in alum dissolved in water. Proportion: 1 pound alum to 1 gallon water. Then wash wool clean with plain soap. To color, use aniline of any shade you desire. Dissolve 1 pound aniline in 2 gallons water; strain before using; then float skin in a dye box, wool down. See that they lie flat, and let remain till color or shade you desire comes; then take out and run through clear cold water, and hang up in a hot room to dry. For plain white, wash the skins well, after tanning as described above. If not white enough, hang up in a small room and bleach with powdered sulphur. Set in a pail in center of room burning. Be careful to have no escape of the sulphur fumes, and have the room air tight.—*Shoe and Leather Reporter.*

AN IMPROVED WHEEL FENDER FOR CARRIAGES.

A wheel feeder and dress protector adapted for use on any kind of road vehicle, capable of being used as a fender upon the road and as a dress protector in mounting and dismounting, being easily placed in either position by a person seated in the vehicle, is illustrated herewith, and has been patented by Messrs. Arthur C. Rogers and Henry Stenz, of Faribault, Minn. In the upper end of a clip fastened on the axle is produced a compound recess consisting of a circular aperture, and a lower central intersecting aperture, in which is mounted a hub, from which extend arms or rods supporting a fender of the usual construction, a bar curved in conformity with the fender, and just below it, bracing and sustaining the arms extending from the hub. Upon the outer face of the disk-like hub, mounted in the clip fastened on the axle, is a central projection, of a form to admit of an easy and firm fit in the lower portion of the compound recess in the upper end of the clip. From the upper rear wall of the circular aperture in the hub projects a stop pin to limit the rearward throw of the device, and on the threaded lower ends of the clip is fastened a stop bar, with its forward free end turned up and bifurcated. The small views show in section the position of the parts when the device is used as a fender and as a dress protector. In the perspective view, the fender on the

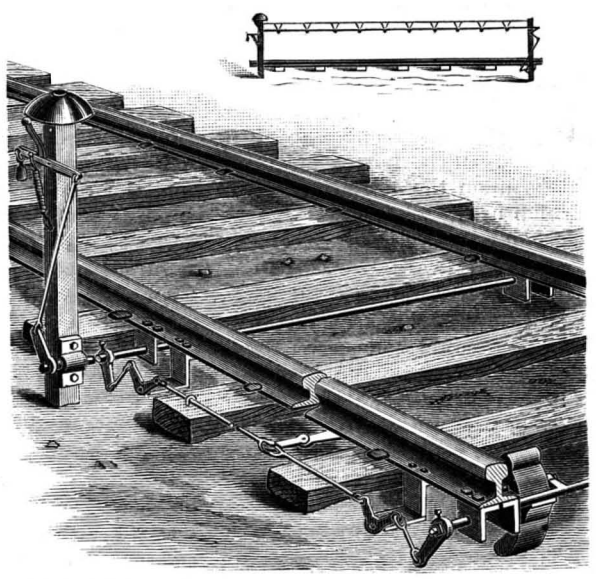


ROGERS & STENZ'S WHEEL FENDER FOR CARRIAGES.

right hand wheel of the vehicle is in the usual position for travel on the road, the central projection in the outer face of the hub then fitting in the lower portion of the compound recess in the clip. The device is moved from this position to that of a dress protector, as shown on the left hand wheel, by slightly raising the hub in the clip, when it drops forward until the front arm supporting the fender engages the bifurcated end of the forwardly extending and upwardly curved stop bar, bringing the fender in position to act as a guard over that portion of the tire adjacent to the step.

AN IMPROVED RAILWAY CROSSING ALARM SIGNAL.

A simple and efficient device for automatically sounding an alarm as a railway train approaches a crossing is illustrated herewith, and has been patented by Messrs. George D. and Christian Rathmann, of Blair, Neb. A rock shaft is mounted transversely beneath the rails, upon brackets secured to their under sides, with one end of the shaft extending beyond the rails,



RATHMANNS' RAILWAY CROSSING ALARM SIGNAL.

to the side of the track, and carrying a lever arm connected to a pivotally supported bell crank lever, the latter being also in connection, by means of a wire suitably supported along the track, with a distant bell crank lever mounted in close proximity to a post carrying a gong, the bell crank lever being also connected with a hammer arranged to strike the gong. Just within the line of one of the rails, and in position to be struck by the flanges of the car wheels, a tripping dog is mounted upon the transverse rock shaft, the dog being normally held in nearly vertical position by a counterpoise, so that it will be turned downward and return again to position as each wheel of a train passes over it, thus operating the bell crank lever at the side of the track, and, through the wire stretched along to the post at the crossing, these impulses will be communicated to the hammer which strikes the gong, thus sounding an alarm at each approach of a train, the hammer being drawn back after each stroke by a suitably arranged spring or weight. The wire supported along the track may be carried by proper supports from posts placed at suitable distances apart, or it may be carried along the ties, or in a tube suitably arranged in connection therewith.

How to "Manage" Sewing Machines.

To the average manufacturer, whose business does not justify the keeping of an expensive expert, there is no piece of machinery that gives so much trouble and annoyance as the sewing machine. Very few men have patience enough to wrestle with one of them if it happens to be refractory. This ingenious and indispensable piece of mechanism, like most other things, is docile and tractable, however, when in the hands of one who understands it. Not long ago a Philadelphia merchant essayed to adjust his wife's sewing machine. After working a short time he became interested. He passed from that state of mind by regular stages to agitation, disgust, and to a towering rage. The result was a grand *denouement* with an ax and a succession of vigorous strokes.

Ths great trouble about amateur tinkering with a sewing machine is that too much is done. When any portion of the mechanism fails, it is usually for some trifling cause. Two or three little faults will make a combination calculated to prove intensely exasperating. The first endeavor then should be to find out just what is the matter. In this sort of doctoring, as in the science of medicine, the first, and by far the most difficult, thing is diagnosis. Having formed a reasonable theory of cause and effect, proceed with your remedy, and if a trial shows your judgment to have been defective, undo or replace the part altered before going any further. To begin with, one thing may be wrong which escapes your notice. Hence each time you make a change, the difficulty is in consequence multiplied. To become master of the art of repairing a sewing machine, it is requisite to understand the principles upon which the stitch is formed and the work fed. Little manual skill is needed. The parts are made by machinery, and are interchangeable, obviating the necessity for filing and fitting. Any observing and competent fore man or woman of a fitting or stitching room can learn to repair the modern sewing machine.

The breaking of silk or needles and the skipping of stitches can be remedied nine times out of ten in a few moments by turning a screw, or adjusting some part that has become displaced. If the needle is dull, or bent, or sharp in the eye, discard it at once and try again. If your machine breaks the silk, examine the broken end and determine whether it was cut or torn, also measure the end down from the take-up, so as to decide at what point in the revolution the trouble occurred. Turn the wheel slowly and watch the silk pass around the shuttle, and see that every part touched is smooth and clean. Many times a machine can be made to resume its good behavior by simply taking out needle and shuttle, giving it a thorough cleaning and oiling, without loosening or disturbing the adjustment, and then starting afresh. Of course, these machines occasionally defy for a time the best efforts of experts; but in very many cases they will readily yield to gentle treatment.

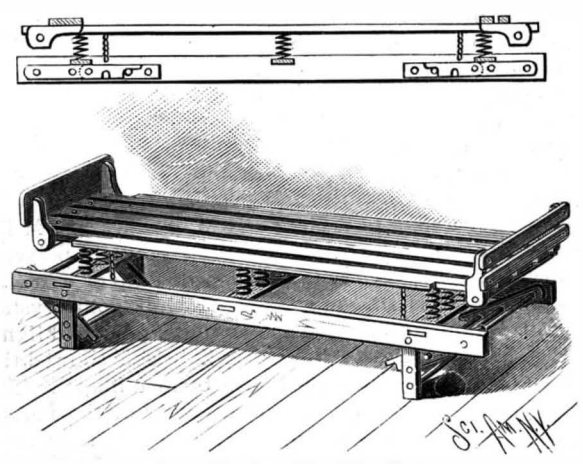
In the various fabrics on which a machine is used there is quite a diversity in the thickness and character of the work required. Frequently a machine working badly on one branch can be easily coaxed into performing valuable service in another. It is a good plan for every one having the care of sewing machines run by steam power to occasionally lubricate the points of greatest wear, such as the take-up cam, for instance, with heavy oil, meanwhile keeping each supplied with oil of lighter density for daily use. Wheel feed machines are always more expensive to keep in repair than the drop or step feeds, and hence should never be used when the latter will answer the purpose just as well.—*Shoe and Leather Reporter.*

Progress of the Ship Canal between Manchester and Liverpool.

An extraordinary meeting of the shareholders, for the purpose of approving a bill now before Parliament to authorize certain alterations in the plans of this work, was lately held. In the course of the proceedings it was stated that there were 56 steam excavators, 73 locomotives, 2,367 wagons, 50 steam cranes, 79 miles of temporary railroad, and 6,000 men employed. The excavations during the month of May amounted to 21,371 cubic yards of rock and 1,009,052 yards of soil. The bill provides for an alteration in the plans which gives 114 acres of water space, against 100 in the old scheme, the quay space being 152 acres, against 83, and the quay frontage 5⅛ miles and 4 miles respectively. There is thus a large increase in the accommodation provided, while the cost is reduced by £23,000. In the course of a few remarks, the contractor, Mr. Walker, said that he had 48,000,000 cubic yards of excavation to carry out, which would mean about 1,000,000 yards per month. This rate was now exceeded, and before the end of the summer he hoped to excavate 2,000,000 yards per month. The bill was unanimously approved, and the general tone of the meeting was a confident one.

AN IMPROVED FOLDING COT.

A cheap, strong, and simple folding cot, in which the slats are supported directly by the springs, and which, when folded, occupies but small space, has been patented by Mr. John C. Porter, of No. 181 First Avenue, New York City, and is illustrated herewith, in perspective and a sectional view of the cot when folded. The side pieces of the main frame are secured together by cross pieces, to which are attached the coiled springs which support the slats. Folding legs are pivoted to the under side of the side pieces near their ends, being secured together in pairs by rounds, notched holding arms, also pivoted to the side pieces,



PORTER'S FOLDING COT.

and held together in pairs in the same manner as the legs, being adapted to fold up between the side pieces with the legs, or, when the latter are turned down, to serve as stops and braces therefor. When the cot is folded, the legs and holding arms lie flat against its bottom, between the side pieces, but to arrange it for use, the legs and folding arms are pressed downward, and the notches in the latter placed in engagement with the rounds of the legs. The ends of the slats are also provided with folding head and foot pieces.

THE French government has organized a competitive exhibition of machines for decorticating ramie, to take place in August next at Paris, and 30,000 francs have been appropriated to defray expenses.

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Microscopy.

The following is a list of the microscopical subjects exhibited at the reception recently given by the science department of the Brooklyn Institute:

Living desmids, by Edgar J. Wright. Desmids are microscopical plants living in fresh water. Their mode of propagation is by division, each half becoming a new plant. Skin of chameleon, by H. W. Calef. The chameleon is a kind of lizard, which sheds his skin every six months, when he rolls it up in a ball and swallows it. They are found in Florida, Egypt, and elsewhere. The skin is made up of minute scales, which overlap each other and reflect the light more beautifully according to the point of illumination. Mr. John Green showed the gizzard of a cricket, which gave some idea of how minutely and carefully the work of dissecting must be done to preserve and mount such an object. Professor A. K. Eaton presented a spectra microscope showing various spectra.

Exhibit No. 6 illustrates the use of the microscope in detecting food adulterations, specimens of pure baking powder and the adulterated article. This exhibit was by Charles J. Lawler. Professor W. Le C. Stevens presented a specimen of native copper, viewed binocularly with a Ross one and a half inch objective. Mr. George M. Mather, Anemia Mexicana, a variety of fern showing balloon-shaped pouches containing spores or seeds of the plant, also fossil insects in amber.

A. A. Hopkins showed crystals in glass. These crystals were accidentally produced in the process of glass manufacture, their nature is unknown, but they are very beautiful. Tumbling chips of selenite shown with polarized light by G. M. Hopkins were very curious and very beautiful.

Mr. Hopkins' exhibit of the circulation of blood through the tail of a gold fish attracted a great deal of attention, a crowd being around him during the whole time. A small live gold fish was put under the instrument, when the blood could be seen coursing through the veins of his tail like water running through a mill race. The microscope as an aid in finding parasites was illustrated by exhibit No. 13.

Trichina spiralis, which was dissected out of a human muscle, was shown by Mr. Joseph Ketchum. The same exhibitor showed a series of compound pendulum tracings on smoked glass, also a very beautiful series of crystals from the asparagus plant shown by polarized light. Dr. D. R. Brown showed blood corpuscles of amphiuma. Dr. William S. Torrey, section of kidney. Mr. P. S. Pretz, a louse. H. L. Brevoort, M.E., arranged diatoms. Theodore Gregg, elytron of a diamond beetle. W. H. Kent, naphthalene, a product of coal tar. It is one of the wonders of science that a specimen showing the most beautiful colors could be found in a substance like coal tar.

Exhibit No. 22 was butterfly scales and diatoms arranged as a vase, with fern and birds, by Henry E. Fincke; also, by same exhibitor, the feather of a humming bird, and an alkaloid obtained from the bark of a willow, displaying most beautiful colors. Mr. E. C. Chapman, minute shells from the bed of the ocean. These shells were inhabited by a jelly-like creature belonging to a lower order of animal life.

By Professor W. C. Peckham, platino-cyanide of magnesium crystals shown by polarized light, and internal hairs of yellow water lily. H. S. Woodman, specimens of pond life. George E. Ashby, tingis hyalina. Henry E. Fincke, a microphotograph representing Paul preaching at Athens. This subject to the naked eye is about as large as the head of a pin. Mr. Fincke also has a bouquet of flowers made of butterfly scales, and a specimen of arranged diatoms. H. Endemann, Ph.D., exhibited a microspectroscope. H. B. Baldwin, a very interesting and beautiful series of crystals found in butter. F. J. Wulling, transverse section of a stem of a plant. H. A. Tucker, Jr., M.D., saws of a saw fly. George B. Scott, group of polycystinæ. Z. T. Emery, M.D., section of pulp of a tooth. A. J. Watts, M.D., some very beautiful gold crystal.

No. 42 was rock section shown under polarized light, by J. W. Freckelton. Rev. J. L. Zabriskie showed the radula, or lingual ribbon, of the bonnet limpet. The radula is a thin flat band on the floor of the mouth of many mollusks, furnished with many transverse rows of sharp teeth, used in rasping the food. The radula of this species gives unusually brilliant colors by polarized light. F. D. Bailey, M.D., vertical section of the human scalp. Joseph H. Hunt, M.D., horizontal section of the human scalp. Thomas B. Briggs, section of graphic granite. This is a structural variety of aplite, a rock of limited occurrence, in which the quartz resembles Hebrew characters.

By James Walker, section of basalt from Palisades of New Jersey, shown by polarized light. Frank Healy, pollen on the anther of the marshmallow. By Dr. Herbert Fearn, M.D., transverse section of the stomach of a frog, also transverse section through the nail and finger of an infant. J. W. Martens, Jr., diaphragm of petiole of pickerel weed. Dr. H. N. Hoople, section of normal lung. By J. C. Cable, M.D., section of intestine of a cat. E. M. Woolley, M.D., injected muscle showing Trichina spiralis encysted within fibers. By Edgar S. Day, M.D., lining membrane retina of eye of a rat. Dr. W. D. Bancker, Jr., embryo of star fish, stained. Dr. Alexander Hutchins, section of kidney of cat. J. H. Gunning, M.D., longitudinal section of human bone. Dr. S. E. Stiles, M.D., skin from back of a dog, showing hair bulbs and director muscles of the hair. By Dr. Edward W. Victor, pollen on pistil of Colorado anemone. C. H. Taylor, pond life, showing a variety of living forms. Tobias New, foraminifera from River Nene, Cambridge, England, being minute chambered cells.

A feature of the exhibition was the drawings of microscopical objects and their explanation by Stephen Helm, F.R.M.S. The whole exhibition reflected great credit upon the microscopists of Brooklyn, and especially upon the microscopical section, the officers of which are as follows: George M. Hopkins, president; Joseph Ketchum, vice-president; George E. Ashby, secretary; Edward C. Chapman, treasurer; executive committee—John H. Hunt, M.D., George M. Mather, and Professor W. C. Peckham.

No one could look upon the large audience which crowded the Brooklyn Institute on this occasion and say that our people are not interested in scientific research. The success of this reception augurs well for the future progress of the new scientific department of the Institute.—*Brooklyn Eagle.*

Electric Night Signals for Use at Sea.

The system of signals by incandescent electric lights as recently adopted in the German and Italian navies was exhibited by Lieutenant W. H. Beehler, United States navy, on board the United States steamer Atlanta, at Annapolis, recently, during the graduating exercises.

The electric lamps are used in three lanterns twelve feet apart, hoisted at the masthead, and the lights are displayed by means of a switch box to open and close circuit through the combination of lights to make the desired signal. The lamps are arranged in pairs of one red and one white Edison lamp. Each of the three lanterns contains a pair of lamps, and no two lamps in the same lantern are displayed at the same time.

The switch box is a brass cylinder five inches in diameter and two inches high. Its upper surface is a dial with fourteen disks, one quarter of an inch in diameter. These disks are made of pieces of red and white glass arranged to show the same combination of signal lights displayed in the lanterns aloft. It has an index, and the knob in the center serves as a key, which, when raised, closes the circuit through the lamps aloft, corresponding to the combination covered by the index on the dial. When this knob is depressed, the lights aloft are immediately extinguished. The box has terminals to the dynamo machine, and six wires with a common return wire to the Edison lamps. It also has a receptacle for a small Edison lamp in the box to illuminate the red and white glass disks on the dial to be visible at night.

The fourteen combinations possible are as follows: White, 1. Red, 2. White—red, 3. Red—white, 4. White—white, 5. Red—red, 6. White—red—red, 7. Red—white—white, 8. White—white—red, 9. Red—red—white, 0. White—red—white, correct. Red—white—red—preparatory. White—white—white—answering. Red—red—red, interrogatory.

The system is readily adapted for the general naval signal book and telegraphic dictionary like the flag numerals of day signals. In order to make any signal, the message is first sought in the signal book and the number corresponding thereto is then signaled.

Records of the Fastest Atlantic Steamships.

The Cunard steamship Etruria was off Sandy Hook at noon on Saturday, June 2. The record had been beaten several times, not only by different vessels, but the Etruria had beaten her own record more than once. The Etruria left Queenstown just after lunch on Sunday, May 27, and was off Sandy Hook nearly two hours before lunch on Saturday, June 2. While the apparent interval of time was three hours less than six days between the two points, owing to the difference in time of four minutes to each degree of longitude she had crossed, she was actually six days one hour and fifty-five minutes between the two points, a span of 2,854 marine miles. Her average runs were 471 knots every twenty-four hours, but on one day, the day previous to her arrival off Sandy Hook, she made 503 knots. This was at the rate of 21 knots an hour, 2,124 feet each minute, and 35 feet each second, and for the entire run an average of 19 6-10 knots an hour. Previous to this last unprecedented trip of the Etruria she was the bearer of the champion pennant as the "Queen of the Ocean," but the pennant had alternated between the Alaska, the Arizona, the Aurania, the Oregon, the Umbria, and the Etruria. This, however, does not say that the steamers of the French and the North German Lloyd lines enumerated above are not equally fast, but as they sail between different ports their trips are not calculated in the comparison of the speeds between Queenstown and New York. For instance, the Aller, of the North German Lloyd, made the trip from New York to Southampton in September last in 7 days 4 hours and 25 minutes. This is equivalent to making the run to Queenstown in 6 days 9 hours and 49 minutes. The following is a table of the fastest transatlantic trips made and the vessels which made them:

		d.	h.	m.	Year.
EASTWARD.					
Etruria	N. Y. to Q'stown	6	4	36	1887
Umbria	N. Y. to Q'stown	6	7	10	1887
America	N. Y. to Q'stown	6	10		1884
Oregon	N. Y. to Q'stown	6	10	10	1886
City of Rome	N. Y. to Q'stown	6	18	30	1885
Alaska	N. Y. to Q'stown	6	18	37	1882
Arizona	N. Y. to Q'stown	7			1882
Servia	N. Y. to Q'stown	7	7	41	1882
City of Berlin	N. Y. to Q'stown	7	15	48	1875
Britannic	N. Y. to Q'stown	7	20	9	1873
Aller	N. Y. to S'thampton	7	4	25	1887
Lahn	N. Y. to S'thampton	7	7	35	1888
Trave	N. Y. to S'thampton	7	9	15	1887
La Bourgogne	N. Y. to Havre	7	13	34	1886
WESTWARD.					
Etruria	Q'stown to N. Y.	6	1	55	1888
Umbria	Q'stown to N. Y.	6	4	12	1887
Alaska	Q'stown to N. Y.	6	21	38	1883
Britannic	Q'stown to N. Y.	7	10	53	1887
City of Berlin	Q'stown to N. Y.	7	18	2	1875
Gallia	Q'stown to N. Y.	7	18	2	1882
Lahn	S'thampton to N. Y.	7	9	45	1888
Trave	S'thampton to N. Y.	7	13	30	1888
Aller	S'thampton to N. Y.	7	14	35	1887
La Bourgogne	Havre to N. Y.	7	12	..	1886

Vegetable Silk.

The *Moniteur de la Teinture* says: The vegetable fibers, to whichever class they may belong, are first of all treated for four hours in a bath of caustic soda at 12° B., the temperature being kept at 175° F., by which treatment the gums and resins are quite destroyed, leaving the fibers of a slightly yellow color, which is easily removed by a lukewarm (85°) solution of sulphuric acid at 60° B. The material is next well washed until it does not redden litmus paper, and is then subjected to a solution of chloride sodium at 7° B. The bleaching process being now completed, the fibers are dried, and are next placed in a bath of glucose or sugar at 8° B., for four or five hours, after which they are again dried, and then placed in a mixture of sulphuric and nitric acids, which will change the sugar into nitrosaccharose and the cellulose into trinitro-cellulose. This treatment should be followed by extraction, then by a fresh soap bath and by another rinsing. Next, the material should be placed in a bath of sumac at 85°, or of some other material that will impregnate the fibers with tannin, and this is to be followed by a cold solution of double tartrate of antimony and potash, which solution should contain about 30 per cent of the weight of the material. The fibers prepared in this way can be used either mixed with some other fiber or alone, but if they are mixed, they should be softened with either glycerine or olive oil.

A Proposed "Three Americas" Exhibition in 1892.

The chairman of the House Committee on Foreign Affairs in Congress has been authorized to report a bill providing for a permanent exposition of the Three Americas, in honor of the 400th anniversary of the discovery of America, under the joint auspices of the forty-six States and Territories and the sixteen independent nations of the American continent.

The bill provides that space for the exposition be assigned, under the direction of the President, in some unoccupied governmental reservation in Washington, as follows: 1. Space for a permanent State and Territorial building for a permanent exhibit of the representative history, resources, arts, and industries of the forty-six States and Territories of the United States, to be available whenever the States and Territories, or a majority thereof, shall make the necessary appropriations for the expenses of building and exhibit. 2. Space for a permanent Three Americas building for a similar permanent exhibit of the fifteen Spanish-American republics, the empire of Brazil, the dominion of Canada, and the various colonies of North, Central and South America, the space to be available whenever such nations and colonies, or a majority thereof, shall make the necessary appropriations for the expenses of building and exhibit. 3. A suitable site for a statue of Christopher Columbus, to be available whenever the necessary funds are provided for the expenses of the proposed statue.

The Tehuantepec Ship Railway.

The directors of the company formed under the leadership of Captain Eads to construct a ship railway across the Isthmus of Tehuantepec, Mexico, between the Mexican Gulf and the Pacific Ocean, met on June 9, in Jersey City, and gave the contract for the construction of the road to the Atlantic and Pacific Railway Company. The work is to be completed in five years. William Williams and Colonel John Andrews, of Pittsburg, were authorized to negotiate the bonds in America and Europe. The Mexican government has made liberal concessions. Vessels will be lifted in cradles and drawn on the track by steam engines. This ship railway may yet be in successful operation before the De Lesseps canal is completed.

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Correspondence.

The Clay Eaters of North Carolina.

To the Editor of the Scientific American:

I notice in your paper of June 9, a communication from this State refuting an article on "Carolina Clay Eaters" by Dr. Frank H. Getchell. Without calling in question any of the statements made by your correspondent, J. J. Bruner, which are undoubtedly true, yet it is also equally true that there *are* people in this State who eat clay.

My own servant girl (colored of course) often appears in the morning with her lips white with the clay upon which she has been lunching. When I asked her if she ate clay, she replied in the affirmative, and admitted that many other of the colored people in the vicinity were addicted to the same practice. Whether or not any of the white people have the same habit, I have no means of knowing. I tried to find out why they ate clay, but the girl in question could give no reason, except that it has "sort of a good taste," though not relieving hunger. J. W. GOODRIDGE.

Southern Pines, N. C.

The Deep Well of Aledo, Ill.

To the Editor of the Scientific American:

I read with much pleasure your recent articles on artesian wells. It may be interesting to the hundreds of readers of your valuable paper in different parts of the country to know that in our city, some twenty miles east of the "Father of Waters," is the deepest well in the "Sucker State," and so far as we can learn, from the data at hand, one of the deepest in the United States. The well, located in our midst, was begun in the latter part of December 1886, and with slight delays in making needed repairs, "fishing sprees," etc., has been in operation since that time, and attaining a depth at this date of 3,110 feet, without a flow—the water rising within 25 feet of the surface. Many curious formations of strata of rock have been penetrated by the drill. Two small veins of coal were passed through, neither of which was of sufficient thickness to warrant mining to a great extent. Below these were found beds of quartz rock and granite, and still below, the Trenton limestone, in which all gas west of the Ohio River is found. This was found in the neighborhood of 1,000 feet. Still below, we entered the stratum known as Saint Peter's sandstone, the best water-bearing stratum known to the geological world. In this we found a flow—as has been the case in every instance where it has been tapped—but not of sufficient head to flow from the surface—some 55 feet below. This may be accounted for by our high elevation. Not being satisfied with this, the city council ordered the work of drilling prosecuted further, in the hopes that with increased depth a stronger head might be thus obtained. No perceptible change in the stage of water took place until reaching the Red Potsdam stratum, which continues at this depth, the water remaining at the depth first mentioned. A query now puzzles our citizens as to going still deeper. Flows have been obtained in the Silurian limestone strata. The well has been an expensive experiment, costing at this time over $12,000, but our citizens console themselves in knowing they have a well, the supply of water of which cannot be diminished by twenty-four hours' continual pumping at over twenty gallons per minute. A quantitative and qualitative analysis of the water is pending at this writing, which I will forward upon its receipt from the chemist. W. P. M.

Aledo, Ill., June 10, 1888.

The Railway from the Caspian Sea to Samarcand.

The trans-Caspian railway from Mikhailovsk, on the Caspian Sea, to Samarcand, a distance east of about nine hundred miles, was formally opened on Sunday, May 27, the anniversary of the coronation of the Emperor Alexander III. The first train which passed over the whole line, and which brought General Annenkoff and his colleagues, deputations of learned societies, representatives of the press, and a number of foreigners of distinction, invited specially to share in the inauguration of the new railway, arrived at the appointed time, notwithstanding the floods between Kizil Arvat and Askabad and a considerable rising of the water of the Amu Daria, which threatened at one time to cause some delay. Here the arrival of the train was awaited by General Rosenbach, governor of the Turkestan territory, the embassy from the Ameer of Bokhara, the local authorities, and a mass of people, Russians and natives. Amid the thunder of cannon the train stopped close to the famous Tomb of Tamerlane, where the company alighted. Luncheon was served at the official residence of General Rosenbach, who proposed the health of the Czar, the toast evoking most enthusiastic cheers. Senator Semenoff, President of the Imperial Geographical Society, delivered an address, in which he dwelt upon the eminent services of General Annenkoff, who had so indefatigably labored for the completion of the great railway which had that day been opened.

The Luxury of a Rose Jar.

A delightful perfume for halls and parlors in dwelling houses or hotels can be easily procured at this season of the year, and it is such a pure yet delicious odor that it charms every one. It is simply a rose jar, which should be opened for about one hour every morning and then carefully closed. A writer in one of our English contemporaries describes the best method for stocking the jar, and in doing it suggests the preparation of the rose stock should be detailed to the care-taking member of the family, who never forgets anything. Gather the rose petals in the morning; let them stand in a cool place, toss them up lightly for one hour to dry; then put them in layers, with salt sprinkled over each layer, in a large covered dish—a glass butter dish is a convenient receptacle. You can add to this for several mornings, till you have enough stock—from one pint to a quart, according to the size of the jar; stir every morning, and let the whole stand for ten days. Then transfer it to a glass fruit jar, in the bottom of which you have placed two ounces of allspice, coarsely ground, and as much stick cinnamon, broken coarsely. This may now stand for six weeks, closely covered, when it is ready for the permanent jar, which may be as pretty as your ingenuity can devise or your means purchase. Those with double covers are the best, and very pretty ones in the blue and white Japanese ware, holding over a quart, can be bought for a few shillings.

Have ready one ounce each of cloves, allspice, cinnamon, and mace, all ground (not fine); one ounce of orris root, bruised and shredded; two ounces of lavender flowers, and a small quantity of any other sweet scented dried flowers or herbs. Mix together, and put into the jar in alternate layers with the rose stock, and a few drops of oil of rose, geranium, or violet, and pour over the whole one-quarter pint of good cologne. This will last for years, though from time to time you may add a little lavender or orange flower water, or any nice perfume, and some seasons a few fresh rose petals. You will derive a satisfaction from the labor only to be estimated by the happy owners of similar jars.

An Interesting Memory Test.

Mr. H. H. Ballard publishes in the *Journal of Education* for May 3 the result of a test of the memories and receptive powers of school children. The sentence, "Your redemption from the distress into which you have fallen is in your own hands, and in nowise depends on forms of government or modes of election," was carefully read to one of ten selected pupils, who repeated it as exactly as possible to the next scholar, and this one to the third, and so on to the tenth. The tenth pupil wrote down what he received from the ninth. In one case the sentence emerged from this process as "The redemption of your distress is in your own hands;" in another it was "The invention, which has fallen into your own hand;" and the sentence had dwindled into this already at the sixth pupil. In another case the sentence was whispered, instead of distinctly read, and the process of calling on the imagination when the senses give no clear impression is illustrated in the result, which was, "The attempts into which we have fallen during the government election are very low." In the Pittsfield, Mass., high school the sentence reduced to, "Redemption is in your own hands, and depends upon no formal government nor love." In the senior class of another high school, in which the average age of the pupils was eighteen years, the result was, "Our redemption for our destruction has nothing to do with us." In still another high school it was, "Your distress into which you have fallen is by no means the fault of government." A set of eight-year-old pupils reduced it to "The redemption that lies in your hand is done;" and the first class of the high school in the same town made it "Your redemption into which you have fallen is your own fault." In one school the experiment was modified: Two pupils from each of five grades were selected, and the sentence clearly read aloud to them all. After a minute's interval, each of the ten wrote down what he could of the sentence. The sentences written by one pupil of the highest, one of the middle, and one of the lowest grades were these: "Your redemption from the distress into which you have fallen lies in your own hands, and in nowise depends on the government or manner of election;" "Your redemption from the distress into which you have fallen is in your own hands, and depends in nowise upon the forms of government or the modes of election;" "Your redemption and distress in which you have fallen depends on yourself, and in nowise on the government or its mode of election."

Although not one of the ten got it perfectly accurate, yet many were very near it, and they all show how much more the wear and tear on the sentence is in passing through ten mouths than through one. By the other process one accumulates the combined inaccuracies of all, and one pupil with a very poor receptive organ in the middle of the ten prevents the circulation of a good repetition after him. After this the sentence was passed through the ten pupils arranged in order of grade, and issued as "Your redemption from the distress into which you have fallen depends entirely upon yourself, and by no means upon the forms of government or helps from education." The sentence here selected is quite a difficult one, but an easier one from Emerson was hardly more successful. The sentence was: "All things are double, one against another—tit for tat, an eye for an eye, a tooth for a tooth, blood for blood, measure for measure, love for love," and the result, "All things are good for one another."

Although the test, as thus applied, is too complex to allow valid inferences to be drawn from it, it at any rate shows how difficult it is to repeat accurately what has been heard, as well as how little confidence is to be placed in the declarations of persons reporting the very words of a conversation held weeks or months before. It illustrates, too, in a simple form, the process by which a simple tale becomes an elaborately embellished narrative by passing through several hands, and perhaps it indicates that the powers of careful attention and retention need more systematic training than is devoted to them in the ordinary school work.

A Great Telephone Switchboard.

Nothing more, perhaps, shows the progress made in telephoning than the fact that such an enormous switchboard is necessary for transmitting the business of a station as the one being constructed at the central telephone office, on Cortlandt Street, in this city. A reporter on one of our daily papers thus describes it:

The upright back of the board is pierced with thousands of brass-lined holes, technically known as "spring jacks," and above each hole a number is stamped. Each subscriber whose wire runs to the switchboard has as many of these holes as there are sections in the board. And it is by connecting one of the holes bearing his number with a hole belonging to the "number" called for that the operator gives him the desired connection. The approximate length of the switchboard—which is undoubtedly the largest in the world—is about 300 feet. So expensive are the polished hard woods and electric appliances employed in its construction that the total cost will be about $350,000. It is expected that about September 1 it will be in readiness to receive the wires. The Metropolitan company have purchased several lots uptown, and intend to there erect a building which will almost duplicate the down town building, big switchboard and all. The site is on the south side of West Thirty-eighth Street, between Broadway and Seventh Avenue. The "Twenty-first Street" and "Thirty-ninth Street" exchanges will be consolidated in the new building, which alone will cost about $250,000.

Theory of Diamagnetism.

According to many physicists, Weber and Tyndall among others, diamagnetic bodies take, under the influence of magnets, a state of polarity opposite to that which is taken by iron under the same conditions, and this opinion has become classic in teaching. M. Blondlot, however, according to *Cosmos*, has demonstrated that in reality diamagnetic polarity does not exist at all; and that, following the opinion of Becquerel, all substances and the air itself are, in reality, paramagnetic, a diamagnetic substance being only a substance less magnetic than the air. He recalls, in the first place, the experiments which led Tyndall to his conclusions. A bar of bismuth, placed on a coil and submitted to the action of a powerful electro-magnet, takes contrary poles to those which a bar of iron takes under the same conditions. The experiments of M. Blondlot show that bismuth becomes magnetic in the same manner as iron, but that the change in its polarity arises from the fact that the medium which surrounded it is more magnetic than itself, when the medium is air. He replaced the bar of bismuth by a tube filled with a weak solution of perchloride of iron in methylated spirits. This tube is magnetic, and becomes magnetic in the same manner as the bar of iron when it is in air, a medium less magnetic than itself. But when it is plunged in a vessel containing a *concentrated* solution of perchloride of iron, a medium more magnetic than itself, it becomes magnetic like the bar of bismuth of Tyndall's experiment.

The International Fair at Buffalo, N. Y.

The city of Buffalo, N. Y., is preparing to hold a world's fair from September 4 to 14. All industries are to be represented there, from fine art to bicycling. All tastes are to be catered to. It is proposed to make it the inaugural of a series of annual exhibitions. The affair is under the management of the Buffalo International Fair Association. They have purchased ninety acres of land, and propose to erect thereon the largest fair building in the world—450 feet long and 300 feet wide, and two stories high. Special provision is being made for the exhibition of live stock of all kinds, bench show of dogs, and the like. All classes of manufactured products are to be shown on the second story of the building. A very large list of premiums for animals of all kinds is published. We wish the fair every success, and trust it will become an annual feature of the State's progress.

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BEETLE PHOTOGRAPHY.

BY H. C. HOVEY.

Certain beetles have a peculiar apparatus, enabling them to execute remarkable somersets when laid upon their backs, whence they get their common name of spring beetles or snapping bugs. Their generic name of *Elater*, from the same root as the word *elastic*, is suggested by this power of leaping into the air and alighting again on their feet. This feat is accomplished by having the prosternum elongated into a spine, which fits into a cavity of the mesosternum. The insect, lying on its back, first bends itself upward so that it rests on its head and the tip of its abdomen. It then unbends itself suddenly, the spine enters the hollow described, and thus the back strikes the floor with force enough to throw the creature ten or twenty times its own length into the air. This maneuver is repeated until it finds itself on its feet.

Several species of the *Elateridæ* are luminous in the dark. The common firefly, or lightning bug, of the United States is too well known to need a special description. But its powers are feeble compared with the so-called "lantern flies," or "cucuyos," found in Cuba, Brazil, and Mexico. M. Michelet records the most extraordinary stories of these natural lamps hung on the trees in the dark southern forests. He says that a Spanish battalion, about to disembark, were deterred from doing so, mistaking the cucuyos for matches which they supposed native soldiers were ready to apply to their arquebuses. He also tells us that persons traveling by night are accustomed to pick these fire beetles from the bushes, and fix them on their boots, so as to show the pathway, and put to flight lurking serpents. In the morning the insects are carefully replaced on other bushes, so as to be at hand for the next lonely tourist that may need their aid. Mexican ladies are said to mount the cucuyos as gems in their hair, string them as living diamonds around their waists, or, imprisoning them in gauze bags, tastefully dispose of them amid their robes, where they blaze or pale according to the condition they may happen to be in.

A living specimen of the *Elater* (or *Pyrophorus*) *noctilucus* was recently presented to the Bridgeport Scientific Society, whose curator, Mr. F. C. Smith, has kindly given myself and others the opportunity to experiment with this interesting representative of the *Coleoptera*. It resembles closely the *E. oculatus*, which is the largest of our common snapping bugs. Its length is about one inch and a half, and its prevailing color is a dark brown. On each side of its thorax are oval spots, looking like eyes, which, however, they are not. In the dark these oval spots throw such a strong greenish light as to seem like a pair of tiny electric lamps in full glow. The cucuyo also emits light from between the segments of the abdomen. Placed on a watch dial, its light enables one to tell the time of night. It is sufficiently strong to illuminate a small printed page so that the words are clearly legible. Its radiance appears to be, to some degree, under control of the will. When a jet of gas is rapidly turned on and off, the insect does his best, whether from rivalry or some other cause.

Being desirous of seeing what might be done in the line of photography by this novel phosphorescence (or whatever this peculiar natural light may be), Mr. Smith suggested to Mr. L. Farini the possibility of taking pictures of small objects by this means. The experiments performed in the presence of the writer and other witnesses were surprisingly successful. Finally, at my request, and especially to illustrate this article, Mr. Farini made the accompanying copy of a family portrait. He used a Seed plate, sensitometer No. 24. The *Elater* was held in the fingers within one inch of the original to be copied, and in such a position as to allow the rays to fall perpendicularly on the negative. The time of exposure to bug light was thirty seconds. The subsequent development was by the usual process. Mr. Farini thinks it possible to photograph the fire beetle by its own light, but has not yet done so. What he has already accomplished, however, is certainly a great novelty in photographic art.

It may be added that, in its Cuban home, the *Elater* feeds on the sugar cane, and its larva does much mischief by devouring the roots of the various kinds of tropical plants. It seems to thrive in its northern captivity, eats the food provided for it with avidity, and takes kindly to the scientific experiments in which it is called to share.

BEETLE PHOTOGRAPHY.

CALMING THE SEA WITH OIL.

Admiral Cloue, who, as well known, has occupied himself with the question of calming waves with oil, has recently published upon this subject a most interesting study in which he has reproduced and rendered complete the curious observations already presented by him in a communication to the Academy of Sciences. The author in the first place recalls all the historic notices left by writers or transmitted by tradition among certain maritime populations, showing that the effect of pouring oil on water was well known to the ancients, but has been neglected in modern times through a forgetfulness that it is difficult to explain. We shall not dwell upon these citations; but, as the manner of spreading the oil on the sea presents a great importance from a practical point of view, we shall give by preference a few details as to the arrangements that have already been tried to this effect.

For sea-going vessels, says the Admiral, it seems up to the present that it is in sailing before the wind or standing ahull that the action of the oil is most certain. We have, adds he, seventy-four examples of ships sailing wind astern and seventy-two ships ahull that have succeeded in protecting themselves from the lashing of the sea with a minimum output considering the importance of the result obtained, say with an average of less than six quarts per hour.

Several ships, moreover, have been enabled to use the oil effectively with the waves and wind coming from the quarter, and two are even mentioned that have been able to continue their course with the wind and a rough sea athwart.

The most difficult case is that of a ship sailing head to the waves, and despite the astonishing rapidity with which the oil spreads over the sea, it seems that no success has been obtained in calming the breakers by this means, since the oil has not the time to get ahead of a ship under way. The sole exception that the Admiral is able to cite is that of the English steamer Concordia, which appears to have effectively employed oil for running ten knots against a heavy sea—an example to which was later added that of the German packet Main; but these are isolated, exceptional cases, so to speak, and there are interesting experiments to be made from this point of view, in order to assure a practical distribution of oil around a ship sailing head to the waves.

The reservoir most generally used for spreading the oil is a strong canvas bag of about five gallons capacity. This is filled with oakum saturated with oil, its mouth is tightly closed, and several holes are made in the side with a sail needle. When the wind is astern, one of these bags is often allowed to trail from each angle of the stern, or from a point a little further forward. Certain captains, however, says Admiral Cloue, prefer to attach the bags to the catheads. The bow of the ship, in plunging and repelling the sea, thus spreads the oil and widens the path where the breakers are suppressed. This arrangement appears to be very efficacious.

The bags used have various forms. They are generally cylindrical, with a basal diameter of eight inches for a length of twenty, but they are sometimes more elongated or have the form of a double cone, which facilitates the towage. In principle, it is well to endeavor to obtain a feeble but continuous and regular flow, owing to which the sheet of oil extends to a distance better than by an abundant and too sudden a flow. In addition to bags, it is possible to employ other and less primitive arrangements for spreading the oil, especially a piston apparatus. This latter has the advantage of operating solely through the pitching motion of the vessel. Its operation is certain, but it is somewhat delicate and discharges a little too much oil.

Mr. Townsend, who has recently made an interesting communication on this subject to the Franklin Institute of Philadelphia, proposes the use of a hollow metallic sphere, ten inches in diameter, partially full of oil, to be thrown into the sea with a rope. This sphere would be steadied by a compartment in the interior. The oil chamber would be provided with two valves, one beneath for the admission of water, and the other above for the outflow of the oil, which the water would gradually replace. These valves would permit of regulating the flow in advance, at the moment of throwing the sphere overboard.

In order to be thoroughly efficient, the apparatus must be capable of being placed at a certain distance off on the sea, and be so arranged that the outflow can be regulated for running with side or rear winds, especially if, as is usually the case, the ship has not a rounded bow. At present, a continuous layer of a certain width is thus spread around the ship, and the latter evolutes in it freely, but it is necessary, in addition, to have the possibility of regulating the outflow as

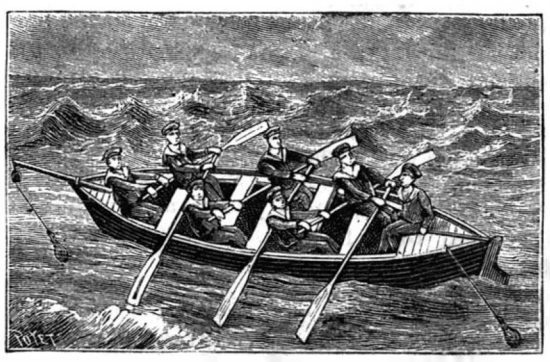

Fig. 2.—LIFE-BOAT WITH OIL BAG.

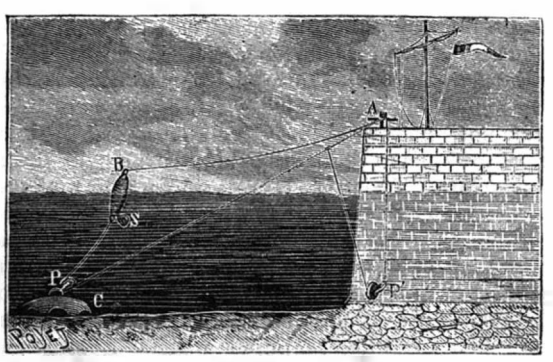

Fig. 3.—OIL BAG AT THE ENTRANCE OF A PORT.

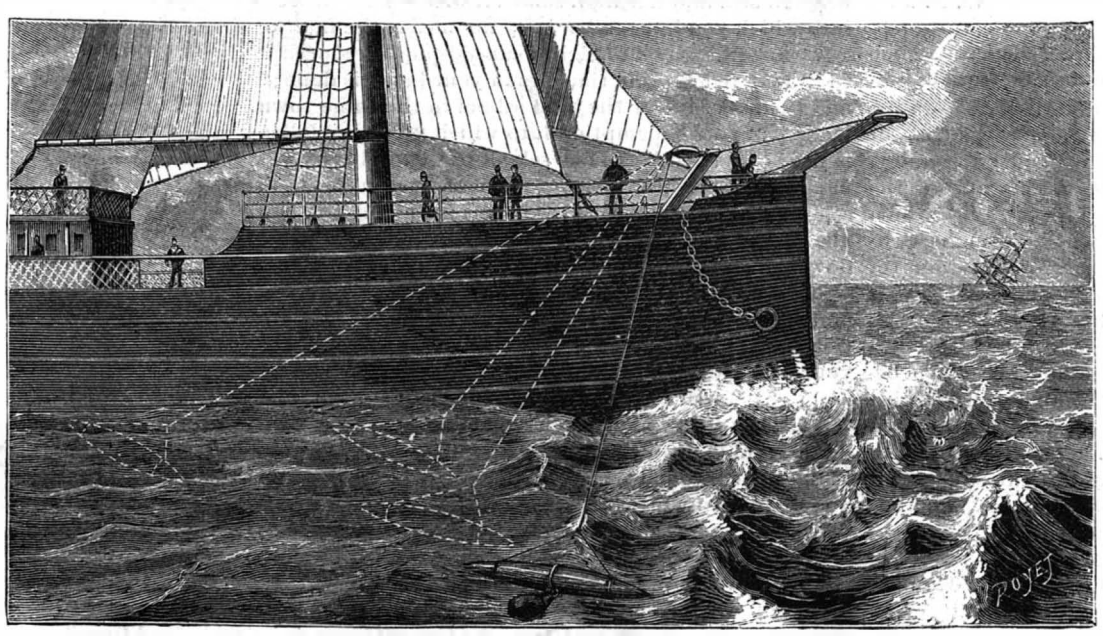

Fig. 1.—SHIP PROVIDED WITH A FLOAT CARRYING AN OIL BAG.

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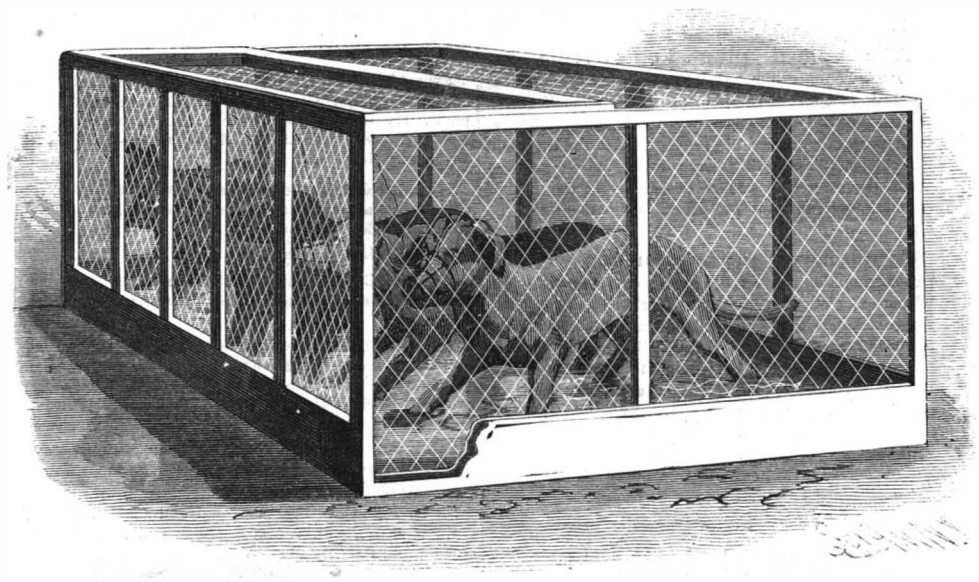
need be. Unfortunately, the problem is far from being solved; but, adhering to the use of bags, the outflow from which cannot be regulated, Admiral Cloue thinks that it would be very advantageous to fix these upon floats that might, after a manner, be directed at will and sent to some distance from the ship. Fig. 1 shows the arrangement proposed by him to this effect. The float employed, which receives the bag in the center, is 8 feet in length, and is provided with a rope girdle, to which is attached a tow line, passing through a pulley fixed to a boom firmly attached to the cathead. The tow line comes on board by passing over the bowsprit. If such a float be put into the sea, it will, through the very speed of the ship, gradually come to a position in which it will efficiently protect the front by furnishing a layer of oil extending all along the vessel. An analogous arrangement may be very advantageously applied to lifeboats (Fig. 2). These latter should be so arranged as to receive the bags either at the bow or stern, or at the sides, suspended from the extremity of a spar if need be.

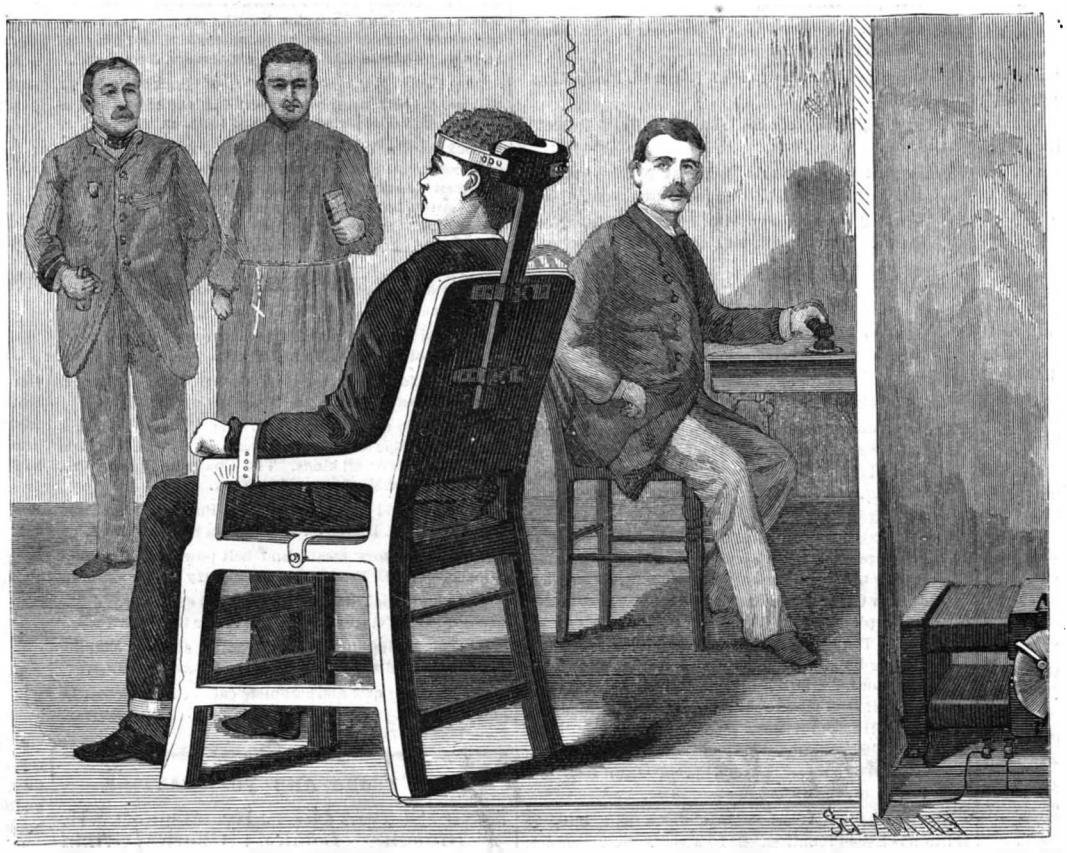
In some British ports, especially at Peterhead, Aberdeen, and Folkestone, different experiments have been made, with the object of rendering the entrance practicable in bad weather. Here, too, oil has been found an efficient agent for arresting the waves, but the method first proposed for distributing it over the surface was deemed too costly, and it was abandoned in favor of canvas bags attached to buoys. At Peterhead, a particularly exposed port on the coast of Scotland, a pipe whose extremity contained numerous small apertures was sunk in the port and extended as far as to the bar at the entrance. Oil was forced into this by means of a pump, and, rising to the surface, calmed the waves, so that vessels could enter the port without accident. The output of oil amounted to 350 gallons, and the result was most remarkable, for the stratum of oil lasted for a long time and formed on the surface a covering that the wind merely stirred without breaking.

The use of oil, then, would absolutely prevent the occurrence of high waves in the interior of ports, and it would be interesting if an appropriate, but less costly, arrangement could be devised, to which recourse could be had in case of necessity. To this effect Admiral Cloue proposes the following arrangement as one that can be very easily carried out:

A cast iron hemisphere, P (Fig. 3), weighing one or two thousand pounds, would be placed in front of the jetties on the shallows that are covered with breakers in bad weather. A pulley, P', receives a chain, the extremities of which reach the front of the mole, and which serves for maneuvering the oil bag, S. This latter is fixed to a buoy, B, which is attached to the chain.—*La Nature.*



PRELIMINARY EXPERIMENTS UPON THE LOWER ANIMALS.



EXECUTION BY ELECTRICITY, SHORTLY TO BE INTRODUCED IN N. Y. STATE.

EXECUTION BY ELECTRICITY.

The State of New York may pride herself in the fact that the gallows is to be banished and a more humane and scientific method of executing criminals is to be instituted. On June 4, Governor Hill signed the bill authorizing that criminals should be put to death by an electric shock. The bill is to go into effect on January 1, 1889, and the new method of execution will be applied in the punishment of crimes committed after that date. The passage of this bill is due principally to the efforts of the commission appointed by the legislature to investigate and report on this subject. The commission consisted of Messrs. Elbridge T. Gerry, Alfred P. Southwick, and Matthew Hale, who deserve much credit as having fathered and engineered this bill at Albany and for having brought it to a successful issue. The subject of execution by electricity has been long argued before the public, but New York State stands as the first government that has undertaken to make the experiment of its practicability. The failure and barbarity of the old system have been amply demonstrated by the sickening scenes that so often characterize our public executions.

The practicability of this method has been studied and experiments have been made under the commission's directions. The result of this has been the method suggested by the commission and recommended in their report, and which is illustrated in the accompanying engraving. The criminal is seated, bound to a chair having a metal seat connected with one pole of the current. At the back of the chair there is an adjustable head rest, having a metal plate on its face and a metal band, which passes around the forehead of the criminal. The wires may be connected with the dynamo, which, according to the bill, may be of any approved type, or the current may be supplied from an electric light plant, or there may be a private plant arranged especially for that purpose at the place of execution. Sponges or dampened cloths should be applied at the points of contact with the convict to render the connection more perfect. At the proper moment the switch is turned by the officer, and instant death ensues. The current passes along the spinal column and attacks the brain and nerve centers. The current may be left on a few moments to bring about complete exhaustion, and to assure against the possibility of resuscitation. In respect to the action produced upon the subject physiologically, Prof. Elihu Thomson says that "in most cases, death seems to be the result of nerve exhaustion and asphyxia, and in others may be due to rupture of blood vessels or injury to the valves of the heart, as a consequence of violent contraction under the enormous stimulus of powerful currents. Broken or interrupted currents or alternating currents, the waves of which are abrupt in character, are, without doubt, the most powerful in injurious effects upon the animal system. I think it would be quite possible to construct a small machine to give the requisite currents by induction from a small storage or other battery current, or a small machine run by hand or by water motor might be employed, which machine would be designed for the most powerful physiological effects, the nature and strength of the current being selected in accordance with this object."

To the end of testing the effect and efficiency of the electric current in destroying life, a number of experiments have been conducted upon the lower animals, under the supervision of the commission. A number of dogs were procured, and the general method employed was as follows: A pine box was provided having a zinc lining, which was connected with one pole of the electric light current which was employed in the experiments. The other pole was connected with a muzzle placed over the head of the dog, and having a copper or iron bit passing through his mouth. As soon as the switch was turned completing the circuit, instantaneous death was produced. The box was partly filled with water during the experiment to render the connection more perfect.

It was desired to watch the effect of the shock upon the functions of the heart, and to that end an experiment was made by making an incision into the trachea of a dog, into which a tube was inserted, connected with a bellows for maintaining artificial respiration. The walls of the thorax were then removed, so that the heart and lungs were exposed to view and their action could be watched. The forced respirations were kept up by means of the bellows. The dog was then placed in the zinc-lined box, and the muzzle and bit were adjusted as above. The current was then applied and the action of the heart was instantly arrested, and became as it was described "a mere mass of quivering flesh," in which not the least resemblance to the rhythmical movement of the heart was observable. Other experiments of the same nature were made, but in each case with the same result, and in no instance was it possible by keeping up the forced respiration to produce resuscitation.

It will be some months yet before the practical results of the use of electricity as a means of execution can be essayed, but of the enormous and deadly influence of a strong current there are constant proofs in the fatal results that have so often occurred in accidental contact with the electric light wires in the streets of our great cities.

There are several other changes in the methods of treatment of the condemned which will be put in practice under the new law. Under the new code the prisoner is to be sentenced to death without the assignment of any specific date. The week only will be named in which the crime is to be expiated, but the day and hour is to be decided upon by the agent or warden of the prison in which the execution takes place.

The announcement of the day and hour will be made only to the persons permitted to be present at the execution. No one can visit the condemned without an order from the court, except the officers of the prison, his counsel, physician, priest, and members of his family.

Many years ago this subject of execution by electricity was introduced and discussed by the SCIENTIFIC AMERICAN, and ever since the question has been one that has been more or less prominently brought before the public. It has now become a law. As a conclusion is appended an extract from an editorial published in this paper in 1873, and which is of some interest in view of the passage of the bill:

"The objection that electrical executions would be free from the horrible impressiveness of hangings might be easily obviated. The criminal, for instance, could be exposed upon a platform, in full view of the assembled witnesses, and manacled to a chair, his irons being connected with a battery and Ruhmkorff coil capable of giving say an 18 inch spark. The mode of closing the circuit might be a simple button, to be pressed by the finger of the sheriff. Then, when the usual formalities conclude, the latter official establishes the current, the convict instantly expires, and all is over. There would be no slipping nor breaking of ropes, no black caps, no suspension of a writhing form for twenty minutes or half an hour, none of the grim watching for death by the medical attendants, nor any of those hideous surroundings which now only serve as food for sensation mongers, and prove that a relic of barbarism can still be retained in the laws of a civilized country."

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ENGINEERING INVENTION.

A steam muffler has been patented by Mr. Thomas E. Hill, of Rahway, N. J. It has an outer and inner casing, with perforated plates surrounding the latter, held by rods and spaced by short intermediate tubes, there being a weighted lever to determine the pressure at which a valve will lift to blow off steam, with other novel features.

AGRICULTURAL INVENTION.

A potato planter has been patented by Mr. James W. Estes, of East Atchison, Mo. It is supported upon a wheel carriage and has an adjustable furrow opener, adjustable covering blades, distributing arms arranged to reciprocate within a hopper, and vibrating fingers to pick the potatoes from the hopper and deposit them within a vertical tube in rear of the hopper.

MISCELLANEOUS INVENTIONS.

A fare register has been patented by Mr. Henry R. Coffey, of Stockton, Cal. This invention covers a novel construction, combination, and arrangement of parts for a register designed to be simple, convenient, and durable, and which may be readily carried about the person of the operator.

A glove fastener has been patented by Mr. George H. Coursen, of Baltimore, Md. It has a cylindrical keeper with one lower edge struck up to form a lip, and a radial locking bar, with a series of teeth on the under surface, adapted to project through the keeper and engage the lip.

A glove fastener forming the subject of another patent issued to the same inventor has a locking plate provided with an arched body, and an inwardly curved latch integral with one end having an outwardly projecting horizontal tongue, there being a keeper with a slot in its upper surface adapted to receive the latch and tongue.

A bench stop has been patented by Mr. Isaac H. Terrell, of New York City. It consists of a strip of steel with one end sharpened and turned down, in the form of two prongs, while the other end has teeth, and steel projections thereto, making a stop which can be readily driven into any part of a carpenter's bench to hold work in position.

A lathe for turning wooden handles has been patented by Mr. Nathan R. Flint, of East Hiram, Me. This invention covers a novel construction and combination of parts in a lathe adapted for turning a number of wooden handles at a time to the shape of a former, and enables the handles to be made larger or smaller than the former.

A chalk line holder has been patented by Mr. Benjamin Howard, of Sheep Ranch, Cal. It consists of an oval flexible chalk receptacle, with eyelets at the ends, one serving as a stopper, so made that the line or cord may be wound on the holder and the line thoroughly covered with chalk as it is drawn through the holder.

A vehicle wheel has been patented by Mr. Henry L. Smith, of Jericho Center, Vt. This invention provides a construction designed to increase the durability of the wheel and axle, and enable a ready and easy attachment of the one upon the other, securing an even wearing of the wheel upon the axle, and enabling repairs to be readily made.

A draught timber for cars has been patented by Mr. John B. Owens, of Jackson, Tenn. The invention is especially adapted to facilitate the construction of freight cars, providing means whereby the draught timbers may be expeditiously and effectively bolted to the sills, while the means employed are very simple.

A locket has been patented by Mr. Joseph Cohn, of New York City. It has an exterior casing with a front and rear plate, between which is pivotally held a picture casing adapted to be locked in place by a spring catch, with a spring held at the pivot of the casing which serves to force the latter outward when released by the spring catch.

A combined bridle and halter has been patented by Mr. John O. Walton, of Belle Vernon, Ohio. This invention relates to halters made of a single piece to fit, respectively, over the head and nose of the horse, secured at the folds by metal corner pieces, upon which it may be readily adjusted, and otherwise secured by metal fastenings without the use of seams or rivets.

A rasp has been patented by Mr. Philip S. Stokes, of Tennent, N. J. It is an improved article of manufacture, in which the teeth are perfectly and uniformly raised from the surface of the plate by a punch, from recesses of less depth than in rasps cut in the usual manner, while each tooth is re-enforced by extra metal, the teeth being brought to a very sharp point or edge without cutting or turning.

A neck tie fastener has been patented by Mr. Adolph Hellenberg, of New York City. It consists of an open spring clasp finished to form the knot of the tie, and made to be opened at the back to receive and retain the neckband after its free end has been passed around the neck, and is to be used in connection with a special construction of the necktie, to avoid the necessity of tying.

A device for side dressing saws has been patented by Mr. George Glass, of Cadillac, Mich. This invention provides means whereby the files serve as guides for the saw being treated, and are so formed that they will not abrade the teeth below the swaged portion, but will equally dress off the opposite sides of this portion, the teeth being held from being pressed to one side or the other, that they may be dressed off evenly as desired.

A knife sharpening attachment for skiving machines has been patented by Messrs. Philo B. Clark and George J. Klingler, of Brooklyn, N. Y. It is for constant attachment to a special construction of leather skiving machine, whereby the sharpening disk may be revolved by power from the machine, the disk being adapted for accurate and convenient adjustment to the knife, and to be used thereon with great facility.

An adding machine has been patented by Mr. Charles C. Moore, of New York City. Combined with a numbering disk and rack for turning it are sliding plates operated by the numbering disk, with a second and other numbering disks also operated by sliding plates, and other novel features, the machine allowing a period of deferred action between an apparent and the actual "carrying," whereby friction and loss of power are obviated.

A combined plug and ferrule for wash tray connections has been patented by Mr. Cornelius J. Phillips, of New York City. The construction is such that the ferrule is made to serve the double purpose of ferrule and holder for the pipe in the tray, and it furnishes the resisting flange for the drawing action upon the pipe by the jam nut, to avoid the use of coupling, and so that any length connection may be used.

A discharge mechanism for vacuum pans forms the subject of two patents issued to Mr. Richard G. Peters, of Manistee, Mich. The inventions are especially designed for application in the manufacture of salt, where the brine is held in suspension in a vacuum pan, and a leg extends therefrom in which the salt precipitates, there being a cylinder and piston connected therewith, and a valve for controlling the discharge of the precipitate, one construction having a leg with valve casing, and a pocket valve rotatably supported therein, with mechanism whereby the valve may be reciprocated longitudinally in its casing.

SCIENTIFIC AMERICAN
BUILDING EDITION.

JUNE NUMBER.—(No. 32.)

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The Holly Manufacturing Co., of Lockport, N. Y., will send their pamphlet, describing water works machinery, and containing reports of tests, on application.

Lockwood's Dictionary of Terms used in the practice of Mechanical Engineering, embracing those current in the drawing office, pattern shop, foundry, fitting, turning, smith's and boiler shop, etc., comprising over 6,000 definitions. Edited by a foreman patternmaker. 1888. Price, $3.00. For sale by Munn & Co., 361 Broadway, New York.

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Tight and Slack Barrel Machinery a specialty. John Greenwood & Co., Rochester, N.Y. See illus. adv., p. 28.

Double boring machines. Double spindle shaping machines. Rollstone Machine Co., Fitchburg, Mass.

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NEW BOOKS AND PUBLICATIONS.

MINE SURVEYING. By Bennett H. Brough. London: Charles Griffin & Co. Pp. 302. Price $2.50.

This is a book intended primarily for students, and embodies the substance of the course of instruction in mine surveying given at the British Royal School of Mines, with which the author is connected. His admission, therefore, that "no mine surveys made in this country [England] approach in accuracy those of the collieries in Pennsylvania, United States," will probably be somewhat of a surprise to English mining engineers, whose attention he directs to "recent improvements in foreign practice." The appendix gives the examination questions and exercises of the City and Guilds of London Institute.

YANKEE GIRLS IN ZULU LAND. By Louise Vercelius-Sheldon. New York: Worthington & Co.

This is a sketchy and spirited account of a visit of a party to South Africa, in search of health. The book is beautifully illustrated, and gives daily occurrences and impressions in a style so vivid that the imaginative reader may almost conceive himself or herself one of the party.

OLD AND NEW ASTRONOMY. Parts I. and II. By Richard A. Proctor. London and New York.

Two parts of this attractive work have now been received, representing a total of 128 pages. In its typography and illustration, nothing is left to be desired, and Mr. Proctor's vivid and picturesque treatment of the subject is tinged with the attractiveness due to the individuality of a pronounced nature. The different methods of projecting the earth's surface occupy much of the second part, and as elucidated, the subject is excellent reading. We also commend the author's preface, in which he gives his views as to why the book should be written, and other details, all expressed in the picturesque way familiar to the readers of *Knowledge*.

AN ELEMENTARY COURSE IN DESCRIPTIVE GEOMETRY. By Samuel Woolf, A.M. New York: John Wiley & Sons. 1888. Pp. x, 152. Price $3.

This work aims at the less severe treatment of its subject. Perspective is freely made use of to indicate the relations of planes of projection to each other, and of objects thereto. Its author, professor in the College of the City of New York, where much attention has long been given to the "poetry of mathematics," as it should be called, embodies naturally the result of much earnest work in the lecture and recitation room. It will be of value to all students beginning the subject. Development of surfaces is treated rather shortly, yet its principles are so simple, and so strictly based on the general subject, that perhaps a little is as good as a great quantity.

THE FUNDAMENTAL PRINCIPLES OF CHEMISTRY. By Robert Galloway, M.R.I.A., F.C.S. London: Longmans, Green & Co. 1888. Pp. xii, 364.

The claim made on its title page, that this work treats chemistry by a new method, is not without foundation. Abandoning the subjective treatment by description of the properties of elements and their characteristic compounds, the author attacks the subject as a whole. Matter, molecular attraction, gravitation, ebullition, density, sublimation, classes of compound subetances, are sample headings, and the scheme is carried out through the whole book. At intervals the practice of chemistry is given in considerable detail. It is not too much to say that the work is a really important advance on the time honored treatment, and many who have studied by the old method would find themselves well refreshed and the scope of their intellectual vision enlarged by the reading of the book. Exercises in calculations and experiments to be performed by the student are scattered through the book, and solutions of such as required are given in the end.

TABLES OF THE PROPERTIES OF SATURATED STEAM AND OTHER VAPORS. By Charles H. Peabody, B.S. New York: John Wiley & Sons. 1888. Pp. 25, 35. Price $1.

This book, in its first section of 25 pages, gives the mathematical treatment of the subject of saturated steam and other vapors. With great clearness the author lays down the principles, and applies formulæ to steam, sulphurous oxide, and ammonia. Then with a new pagination a thirty-five page table of data of saturated steam is given. The book is a most valuable contribution to steam engineering, and seems to supply a want in technical literature.

NOTES ON THE COMPRESSIVE RESISTANCE OF FREESTONE, BRICK PIERS, HYDRAULIC CEMENTS, MORTARS AND CONCRETES. By Q. A. Gillmore, Ph.D. New York: John Wiley & Sons. 1888. Pp. vi, 198. With a number of folding charts. Price $3.50.

The eminence of the distinguished and lamented author of this work, joined to the fact that the tests were made on the great Watertown testing machine, thus giving him the best facilities in the world for his work, render all criticism of this book needless. The titular subject is treated not only in detail, but with great interest, and the reader's attention is never allowed to flag from inadequate expression or tedious prolixity. It is a work that no civil engineer can afford to be without, and it is a good memorial of the author, and a fitting remembrance for all to possess who have followed his career in the engineering world.

SEASIDE AND WAYSIDE. No. 2. By Julia McNair White. Illustrated by C. S. King. Boston: D. C. Heath & Co. 1888. Pp. viii, 175.

This is a good sample of the modern method of teaching. It is a school reader devoted to the natural history of insects, radiates, and crustaceans, so that a bright child, in reading it, will acquire with instruction in reading no inconsiderable information about ants, flies, crabs, star fish, and other familiar, but too little understood, creatures of the lower orders of life. The book is excellently printed and very prettily illustrated.

LESSONS IN GEOMETRY FOR THE USE OF BEGINNERS. By G. A. Hill, A.M. Boston: Ginn & Co. 1888. Pp. viii, 182.

This little work aims at an objective and pictorial treatment of the subject, and with considerable success. It covers linear, superficial, and solid geometry. Reference throughout is made to everyday objects, so as to remove as far as possible from it the abstractness of the Euclidian science. We cordially recommend the book as a sample of an attractive treatment of what is usually considered a dry subject. The author gives definitions. Some of these we would omit, as

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geometrical definitions, even those which have been accepted by generations of geometricians, are often weak, if not absolutely incorrect.

TREATISE ON PATENT ESTATE. By Thos. B. Hall. Cleveland: Ingham, Clarke & Co. 1888. Pp. 240. Price $3.

Although many manuals of patent law have lately been issued, yet in the little work before us a somewhat different treatment is accorded the subject than that which is usually given it in manuals. The author's plan is characterized by a desire to place the subject on a logical basis. The objects of the patent system and the incorporeal nature of patent rights are first considered as a basis for the work. The property rights of patents, profits, partition, and part ownership are all considered in considerable detail. The action for infringement by one part owner against another is the subject of a separate chapter, and the interesting subject is excellently presented. The propositions throughout the work are based on court decisions, and sometimes much of the text is made up of quotations therefrom. This gives the book its standard character, and removes from it the emasculating atmosphere that is apt to be created by the study of mere manuals, from which verbal citations of decisions are excluded. The book has a good table of contents and a full index.

TURNING LATHES. Edited by James Lukin, B.A. London: E. & F. N. Spon. 1888. Pp. vi, 160. Price $1.

This book is an illustrated treatise on lathe work, designed for use in technical schools. The minuteness and practical nature of the directions given, however, make it of value to amateur turners. To those wishing to learn the art from the beginning, it would be hard to recommend a more useful book. Wood and metal turning are both considered, and the description of hand turning is especially full.

The Cosmopolitan Magazine of New York City in its May issue introduced a decided novelty in the way of illustration, consisting of four pages of beautifully colored pictures in embellishment of Moncure D. Conway's rather recondite article on "The Pedigree of the Devil." The general contents of the magazine, besides, are above the average of those of most of the similar monthly publications, and well calculated to make the *Cosmopolitan* a popular favorite. The subscription price is $2 a year.

Ferns and Wild Flowers of the Rocky Mountain Region, pressed and well mounted for preservation, are now being furnished by Mr. P. J. Atkinson, of Colorado Springs, Col. They are bound in books varying in size from 3¼ by 4¼ inches to the standard botanical size of 11½ by 16½ inches, the prices for which range from 50 cents to $10 each set. Some specimens we have seen were very beautiful, and the skill and good taste exhibited in their arrangement and presentation left nothing to be desired. Persons making collections of pressed flowers, leaves, ferns, etc., will derive good information from consulting Mr. Atkinson's collection of Rocky Mountain specimens.

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Notes & Queries

HINTS TO CORRESPONDENTS.

Names and Address must accompany all letters, or no attention will be paid thereto. This is for our information, and not for publication.
References to former articles or answers should give date of paper and page or number of question.
Inquiries not answered in reasonable time should be repeated; correspondents will bear in mind that some answers require not a little research, and, though we endeavor to reply to all, either by letter or in this department, each must take his turn.
Special Written Information on matters of personal rather than general interest cannot be expected without remuneration.
Scientific American Supplements referred to may be had at the office. Price 10 cents each.
Books referred to promptly supplied on receipt of price.
Minerals sent for examination should be distinctly marked or labeled.

(1) F. J. R. writes: I am making an induction coil 3 x 1½ inches, and would like to know what sizes of wire I should use, also whether a bundle of iron wires is very much better than a solid iron core? A. For primary use two layers No. 20 wire, and fill up with No. 34 wire for secondary. The "bundle" core is far the best.

(2) O. K. writes: I have constructed a simple electric motor, as described in SCIENTIFIC AMERICAN, March 17, 1888, and connected it with an Edison light circuit, and it melts the brushes. A. You should reduce the current by introducing resistance, or what is better, place it in a shunt. By a little experiment you will soon arrive at the proper resistance.

(3) J. C. H.—Surface tension or the attraction of cohesion is the principal reason why mercury does not distribute itself all along the tubes when thermometers are laid horizontally. In many thermometers that have large tubes the mercury will separate by turning them bottom end up, and in a few the tube will fill solid by overturning. Mercury expands in bulk as 1 to 1·0154 when the temperature varies from 32° to 212° Fah. Alcohol 1 to 1·11. The expansion of the solid metals is usually expressed as linear; a rod of iron 100 feet long will expand 0·00326 in. for each degree Fah. of rise in temperature, and for a rod 100 feet long of the following metals, the expansion for each degree Fah. will be:

Gold	0·0101 in.	Silver	0·0127 in.
Copper	0·0115 in.	Brass	0·0125 in.
Lead	0·019 in.	Zinc	0·0207 in.
Tin	0·0145 in.	Platinum	0·00571 in.

(4) W. McD. writes: 1. In reference to the construction of the simple electric motor, could not insulated wire be substituted for the shellac-covered wire used in armature? A. Cotton-covered magnet wire is recommended in the article referred to. The shellac insures a more perfect insulation, and at the same time serves to cement the different layers of wire together. 2. What portions of the field magnet correspond to the north and south poles? A. The poles are above and below the center of the armature. 3. Is it possible to make a dynamo to run the motor? If so, would its construction differ in any way from the construction of the motor? If so, what would be the changes? A. A motor can be operated by a current from the dynamo. The dynamo could be made upon the same plan as the motor by using a cast iron field magnet and winding the armature with finer wire, say No. 20. 4. Could the efficiency of the motor be increased by using finer wire? A. It depends upon the quality of the current used for running the motor. For a current of high voltage you should use finer wire. 5. Would not the dynamo be a much cheaper source of the electricity than the batteries, provided you have the power to run it (the dynamo)? A. The dynamo is a cheaper source of electricity than batteries. 6. Is it necessary to charge the field magnet of a dynamo when first constructed, or is there enough residual electricity in the iron to start the current? A. Ordinarily, there is enough magnetism resident in the cores of the field magnet to start the current, but it sometimes happens that it is necessary to supply the magnetism from an outside current. 7. I wish to have my pupils construct an electric motor of say ½ horse power, also a dynamo to run it. We have the appliances of an ordinary machine shop to aid us. Have you ever published, or intend to publish soon, the details of construction of such a motor and dynamo? If not, where can I find such a description? A. In SUPPLEMENT, No. 600, you will find a description of a small dynamo which would also serve as a motor. 8. Have you ever published anything regarding the construction of an electric lamp (arc)? A. You will find in the back numbers of the SUPPLEMENT, descriptions of many forms of arc lamps. See our SUPPLEMENT catalogue and SUPPLEMENT, No. 652. We can also supply Arc and Globe Lamps, by Maier, $3.

(5) C. A. L. asks how to make and put up a mechanical telephone good for a distance of a quarter of a mile. A. For an acoustic telephone use small twisted wire cable picture cord. Stretch it between two disks of thin tin or steel in thickness about No. 34 wire gauge. Disks to be 3 inches diameter, fastened with screws between two pieces of hard wood, so made as to pinch the disks all around. The wire to be fastened to the center of the disks by a loop through a soldered eye. The wire may rest in slings of rubber or leather attached to poles about 150 feet apart. The wire should not turn sharp corners. The disks should be set square with the wire at convenient positions to maintain a strong tension upon the wire, as well as convenient for conversation.

(6) J. C. writes: I am making an induction coil on the general principles of one described in SUPPLEMENT, No. 569. Primary coil is finished, and works very well, but I would like to have a little information. Primary coil has on it four coils of No. 24 wire. Paper tube for secondary coil measures 1½ inches outside. Must I use No. 36 wire, or will No. 32, or even heavier, wire answer the purpose? How many layers will be required, keeping in view the fact that I do not want to get it more than 3 inches in diameter, if possible, and what will be approximate weight of wire? A. There is an advantage in using fine wire in the secondary coil, as the entire body wire will be nearer the metallic core. We think you have made a mistake in making your core and primary coil of such large diameter. You should have from 15 to 20 layers of the secondary wire.

(7) Ph. L. S. asks: How is soluble Prussian blue prepared? A. Add a solution of ferrous sulphate to a solution of potassium ferrocyanide, and expose the precipitate to the air till it becomes blue, and wash it till all the soluble salts are washed away. By continuing the washing, the blue itself dissolves, forming a deep blue solution that may be evaporated without decomposition. 2. How is ink prepared that writes blue and then turns black? A. See the formulas given in SCIENTIFIC AMERICAN SUPPLEMENT, No. 157. 3. How long will quicklime take to dissolve bones, and is the dry or slaked lime the most active? A. Place the bones in a large kettle filled with ashes, and about one peck of lime to a barrel of bones. Cover with water and boil. In twenty-four hours all the bones, with the exception perhaps of the hard shin bones, will become so much softened as to be easily pulverized by hand.

(8) W. M. M. asks the best kind of paint to use on a tin roof, something that will stop leaks as well as preserve the tin. A. Use Prince's metallic paint, or any ground oxide of iron, mixed with linseed oil.

(9) C. R. M. asks a good cement for leather belting. A. Take of common glue and isinglass equal parts, soaked for ten hours in just enough water to cover them. Bring gradually to a boiling heat and add pure tannin until the whole becomes ropy or appears like the white of eggs. Buff off the surfaces to be joined, apply this cement warm, and clamp firmly.

(10) T. S. A. desires (1) a good recipe for lemon sugar, one that will not taste too much of the sugar, and be insipid. A. Citric acid 1 ounce, white sugar 2 pounds, essence of lemon ¼ ounce; powder and keep dry for use. One dessertspoonful will make a glass of lemonade. 2. A recipe for old fashioned ginger pop beer. A. See the recipes given in SCIENTIFIC AMERICAN SUPPLEMENT, No. 270, under the title of "Effervescing Beverages."

(11) G. A. D. writes: In the West a great deal of grain is bound with twine made from manila. Has there ever been any effort made to manufacture binder twine from flax, and what success has it had? Is flax twine any more apt to be "cut" by insects than manila twine? How should twine be treated to prevent insects from gnawing off the bands? A. Binder twine was made from flax in the early days of the reaper. The manila twine is the cheapest. Flax is not affected by insects, to our knowledge. Saturating the twine with salt brine will keep insects from cutting it.

(12) C. E. L. asks: What will drive out large black ants from a pantry? A. Red pepper, sulphur, kerosene, carbolic acid, and similar substances are efficacious in driving ants away.

(13) O. R. R. writes: 1. There is a notion prevalent in this vicinity that, in order to have good well water, the well must be open so as to expose the water to the air, and also that some way of raising the water which agitates it is to be preferred. How much truth is there in the above? A. Agitation and exposure to the air is valuable as a means of destroying organic matter in water. 2. What is the reason that dynamite will explode by percussion, but not by fire? Would a very hot iron cause it to explode? A. It is often impossible to assign a reason for chemical facts. A sudden heat applied to the whole mass might cause an explosion, while the local application would fail.

(14) F. G. asks how to drill by hand a one-half or three-fourths inch hole through a plate of glass one-fourth of an inch thick, for a Wimshurst electrical influence machine. The glass disks are eighteen inches in diameter, and each is to carry sixteen sectors. A. Clamp over the glass disk a board having in it a thirteen-sixteenths inch round hole, the hole to be arranged exactly over the center of the disk. On a brass or copper tube six or eight inches long, and ¾ inch in diameter, secure a spool about 2 inches in diameter, and in the top of the tube insert a hard wood handle having a shoulder which will bear upon the top of the tube. Provide a long bow with strong catgut cord, and operate the tube like a bow drill. Keep the hole in the board supplied with coarse emery and water.

(15) G. E. T. asks: Can you give general proportions for increasing the capacity of the dynamo machine described in SUPPLEMENT to 24 or 32 16 candle power lamps? Does it make any material difference whether the rings of the armature are cast or wrought? How should the machine be mounted? A. If you increase the dimensions one-half (linear), the dynamo will run from 24 to 30 lights. The rings of the armatures should be of wrought iron. The machine should be mounted upon a frame so as to be adjustable, for the purpose of tightening the belt. The belt should be seamless.

(16) G. W. G. asks: What will destroy roaches or drive them away? A. Use fresh borax and Persian insect powder continuously until the pests are exterminated. Or use a phosphoric paste, of which there are several kinds to be had at drug stores. It should be mixed with a little molasses, and put on bits of cardboard or paper, distributed around infested places. The practice should be kept up some time after the pests have apparently disappeared, on account of young ones coming out, say for three or four weeks.

(17) W. C. T. asks if common putty, such as used to put in window glasses, could be used to make the porous cup of a galvanic battery. If not, what is a good way to make one? A. Putty is useless. Make it of clay or use a flower pot with the hole in its bottom corked up.

(18) N. P. K. asks how to polish black marble. A. The process embraces five stages, beginning with the use of coarse materials and finishing with dry rags. A full description of it is given in Spons' "Workshop Receipts," first series, in an article entitled "Marble Working." We can supply the book for $2.

(19) C. S. asks: What will stick celluloid to paper, wood, glass, etc.? A. Try the following: Gum shellac 1 ounce, camphor 1 ounce, alcohol 4 ounces. Dissolve and filter.

(20) C. S. W. asks a recipe for making compressed yeast, also called German yeast. A. It is obtained by straining the common yeast in breweries and distilleries, until a moist mass is obtained, which is then placed in hair bags, and the rest of the water pressed out until the mass is nearly dry.

(21) J. H. N. asks how to make a varnish of bleached shellac to be used in the place of the common shellac dissolved in alcohol. A. Break the gum in small pieces, and macerate in a stoppered bottle with ether; after swelling up sufficiently the excess of ether is poured off, and it will readily dissolve in alcohol.

(22) R. C. asks (1) the proper name to apply to a person who makes insects a study. A. Entomologist. 2. A recipe for an effective insect powder. A. See "Two Valuable Insecticides," contained in SCIENTIFIC AMERICAN SUPPLEMENT, No. 218. Powdered sulphur is likewise efficacious in many instances.

(23) A. H. T. asks: 1. What chemical action takes place when milk sours, and why? A. The milk sugar which it contains decomposes into lactic acid. This process is known as lactic fermentation. See the article on fermentation in any cyclopedia. 2. How to prevent milk from souring. A. Milk is best preserved by the addition of a few grains of bicarbonate of soda or potash, and placing in a tightly corked bottle.

(24) N. A. E. asks how to make rose perfume or rose water. A. Dissolve attar of roses, 6 drachms avoirdupois, in strongest alcohol hot, 1 imperial pint; throw the solution into a 12 gallon carboy, and add 10 gallons pure distilled water at 180°–185° Fah. At once cork the carboy, at first loosely, and agitate the whole briskly, although at first cautiously, till quite cold. See also "Rose Oil or Otto of Roses" in SCIENTIFIC AMERICAN SUPPLEMENT, No. 275. We can also supply you with the Manufacture of Perfumes, by Snively. Price $3.

(25) L. L. U. asks: How much coal will it take to melt 3,000 pounds of light scrap iron in a cupola 20 inches diameter? A. From 700 to 1,000 pounds anthracite.

(26) A. F. M. desires a receipt for taking the rust off drawing instruments without injuring them. A. Mix 10 parts of tin putty, 8 of prepared buck's horn, and 25 of spirits of wine, to a paste. Cleanse the articles with this, and finally rub with soft blotting paper.

TO INVENTORS.

An experience of forty years, and the preparation of more than one hundred thousand applications for patents at home and abroad, enable us to understand the laws and practice on both continents, and to possess unequaled facilities for procuring patents everywhere. A synopsis of the patent laws of the United States and all foreign countries may be had on application, and persons contemplating the securing of patents, either at home or abroad, are invited to write to this office for prices, which are low, in accordance with the times and our extensive facilities for conducting the business. Address MUNN & CO., office SCIENTIFIC AMERICAN, 361 Broadway, New York.

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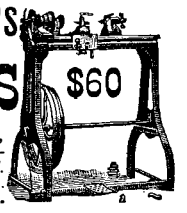

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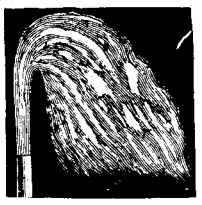

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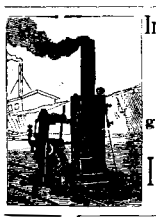

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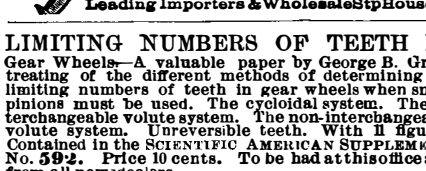

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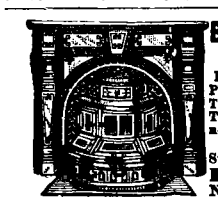

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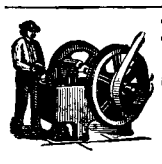

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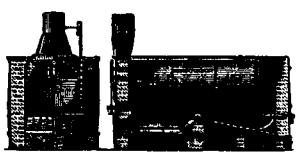

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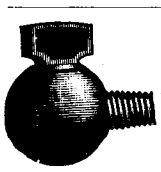

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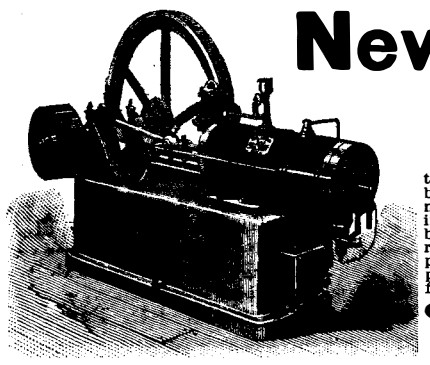

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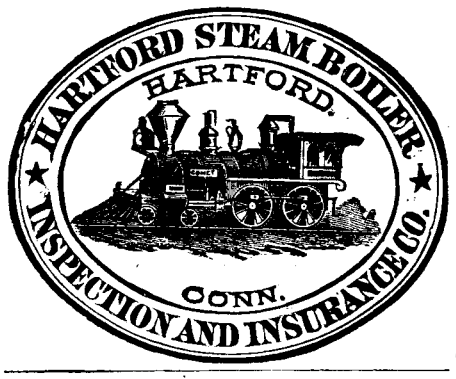

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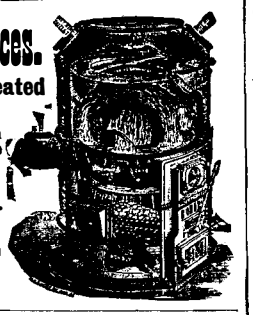

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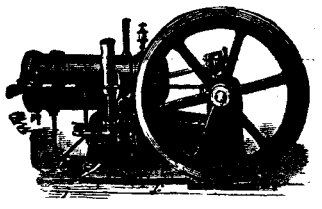

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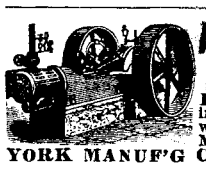

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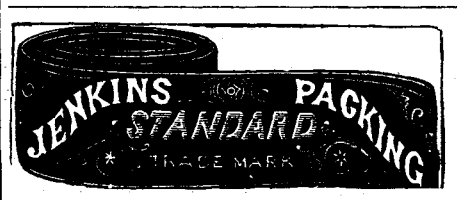

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